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Some Aspects of Current Plate Glass Practice

By Irving E. Adams*

Polished plate glass batches have changed very little with the years. Soda ash in large measure replaced salt cake as a source of alkali accompanying the commercial introduction of the Solvay process. The older batches were apparently a little higher in total alkali, but we must remember that improvements, tending to eliminate impurities, make available today a higher grade product. It seems certain further, that the batches used in former years were prevailingly a little higher in limestone content. Salt was universally used as a batch constituent, which is not true today. Probably the great majority of all batches, past or present, have been well within the following limits:

Sand	=	1,000 lb.
Soda ash	= 275	lb.-315 lb.
Limestone	= 280	lb.-350 lb.
Salt cake	= 50	lb.- 80 lb.
Salt	= 20	lb.-None
Arsenic	= 5	lb.- 15 lb.
Charcoal	= 2½	lb.- 4 lb.

At the present time batches which are most commonly used may be roughly divided into two classes, (1) those of a more or less lean or siliceous character, and (2) those that are relatively high in flux. On a 1000 lb. sand basis the former will range from 275 lb. to 285 lb. soda ash and 290 lb. to 310 lb. limestone, while the latter will carry 290 lb. to 300 lb. of soda and 330 lb. to 350 lb. of lime. It is obvious that the high flux batches are more fusible. It is still a mooted question as to which class, in the long run, will make the best glass.

For purposes of discussion, there is appended below a batch of unquestioned merit, though probably not of general application under diverse fuel and furnacing conditions. The effect of variations among the individual constituents from this normal will be considered, and some general comments on the choice of the raw materials will be dwelt upon.

Sand	=	1,000 lb.
Soda ash	=	290 lb.
Limestone	=	340 lb.
Salt cake	=	60 lb.
Arsenic	=	5 lb.
Salt	=	None
Charcoal	=	53 oz.

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Any decrease in soda from the amount specified above, other constituents remaining the same, would make a better glass. With exceptionally good pots and clean checkers and flues this might be encompassed, but under ordinary commercial conditions 290 lb. is a safe minimum for a batch of this character. Conversely, any increment of soda over the normal indicated affords a prolific source of fine seed which will not plain out at the finish.

With 340 lb. of limestone we are approaching a maximum for this constituent. Probably an addition of another five pounds would be permissible. Beyond this point serious manufacturing difficulties arise. The glass sets too quickly on the casting table; a higher initial lehr temperature is necessary; the annealing time is unduly prolonged; the glass is harder to cut at the cold end of the lehr; and the grinding operation is more difficult. Yet, the well-known fusibility of high limestone batches and their great liquidity, as well as the greater mechanical strength imparted to the glass, has always seemed to the writer sufficient argument to warrant holding the limestone close to the upper limit.

I think all will admit that salt cake should be used in the least amount compatible with bringing down the melt in schedule time. With the fast running times maintained today the amount used will rarely fall below 60 lb. Any increase over this figure will surely promote pot corrosion and consequent liability of throwing stones. Still, if the pots will not stand high temperatures and it seems expedient to slightly increase the total alkali, improvement in glass quality will be brought about more effectively by using more salt cake rather than more soda.

I believe the use of arsenic in small amount is practically universal in plate glass batches. Usually it is present to the extent of five pounds. Larger amounts serve no useful purpose, except possibly in some special cases where it is used in conjunction with nitre. It is a refining agent, serves to steady color, and prevents the tendency toward bluish effects that sometimes develop when the carbon—salt cake ratio is disturbed.

The use of common salt as a fining agent is not so gen-

eral as heretofore. The value of it has always been open to question. The theory is, of course, that in volatilizing it aids in plaining up the glass, but when we remember that it is probably all gone in the early stages of the melt (except that small portion which dissolves in the glass), the subject rests on an insecure foundation. Certainly no case of improvement in quality within the range of my own observations has been due to the presence of it. When used, 20 lb. is the customary quantity added.

Carbon, used to reduce the sodium sulphate to sulphite, is almost always introduced in the form of charcoal. From 3 lb. to 3½ lb. suffice when the salt cake is 70 lb. or less. This quantity is less than the proportion used in window glass practice, although it is several times the amount theoretically required. With no change in salt cake the writer has often reduced the charcoal to 2 lb. and still observed no salt water on the pots.

Selecting the Sand

The plate glass manufacturer is not interested to quite the same degree in raw material costs as is necessary in more competitive lines. He is making a product the value of which increases in geometric ratio with the sizes it is possible to cut free from defects. So there is less quibbling as regards the choice of raw materials. White sand of very high purity is used for melting. This is essential, since enough iron enters the glass from other sources, notably from pot attack, to give the finished product a distinct green color. This choice of pure white sand involves sacrifice, from a production standpoint, for it is a concomitant of their purity and grain size that makes these sands notoriously hard to melt.

Soda ash can be disposed of quickly. It is a standard product. Manufacturers insist on a dense, dustless ash and are apparently not interested in the coarsely granular varieties. Salt cake, on the other hand, will bear closer inspection. Many inferior products, always potential sources of trouble, masquerade under its name. It does not seem unreasonable to insist on a 96 per cent purity, with free acid fairly constant between 1.25 per cent and 1.75 per cent, iron less than .2 per cent, and with calcium sulphate as low as possible. At least one well-known firm readily meets these specifications. If one doubts the relatively greater fusibility imparted to a glass batch by salt cake as compared with soda, he has only to make up an experimental batch using all soda ash. He will never again question the wisdom of keeping a moderate amount of salt cake in the batch.

The Limestone

We now come to a consideration of the role played by limestone in polished plate practice. No other batch constituent has been so frequently credited with responsibility for inducing glass disturbances. It is significant, in view of the controversies current in other lines of glass manufacture as to the relative merits of burnt lime and limestone, that this question was settled at an early date. Limestone is today, and always has been, universally preferred. Again, the plate glass interests have generally decreed in favor of a high calcium stone, with perhaps one notable exception. This same predilection for limestone, and for the high calcium variety, finds a counterpart in the window glass industry.

While all the experimental data on which this decision was based are naturally not available, such unanimity of opinion is impressive. Corroboration, in a decisive manner, happened to be the writer's privilege a few years ago. The newest and fastest furnace was selected, and the best teaser, in a string of five, and fed a properly adjusted burnt lime batch. It was a high calcium lime from the same deposit as the limestone used on the other furnaces, and was used in the same relative proportion. All other factors were unchanged. The test ran five weeks, which meant that nearly six hundred plates were cast. All of the furnaces were suffering from fine seed trouble during this period, but with no other outstanding defects. The glass from the special furnace averaged as good but no better than the others. The limestone was a coarse product. Had it been finely ground, as is customary today, the burnt lime batch might have shown to disadvantage.

A few operators still prefer a coarsely crushed stone, though the general trend is toward a finely pulverized product. It has been amply demonstrated that fine grinding decreases melting time. Limestones high in total iron, though otherwise pure, are mischief makers. Exceptionally pure limestones may be hard to melt.

Standards of Quality Have Changed

If better quality glass is being made today (and it is doubtful if this question can be definitely answered) it is a fine tribute to those actively engaged in supervising the actual glass making process. For the old-timers had everything in their favor. The standards of quality were not so high; they were melting in smaller units; furnaces were the same size as today and melting much smaller tonnages; and hand mixing and filling have advantages, from a quality standpoint, over the elaborate mechanical appliances in vogue today.

The demand for quantity production taxes the resources of the present-day manager, and in no way more than in the matter of obsolete furnaces of inadequate melting capacity. These constitute a real problem. With no change in hearth area, checker volume, flues or stack, these furnaces are now called upon to melt larger tonnages in shorter time, through heavier pot walls, and to handle a much larger volume of exit gases. Further, enlargement of tweels to accommodate bigger pots is done at the expense of the pillars supporting the crown, which, of course, weakens the structure. Checkers clog up quickly and cause the exit gases to channel, and this in turn develops hot and cold areas in the siege. Again, radiation losses are now higher since tweel openings are larger to accommodate the ladle. If the pot process is to survive, cognizance of this fact will result in changes in furnace capacity, similar to the advance to be noted in continuous tank design.

A Typical Melting Cycle

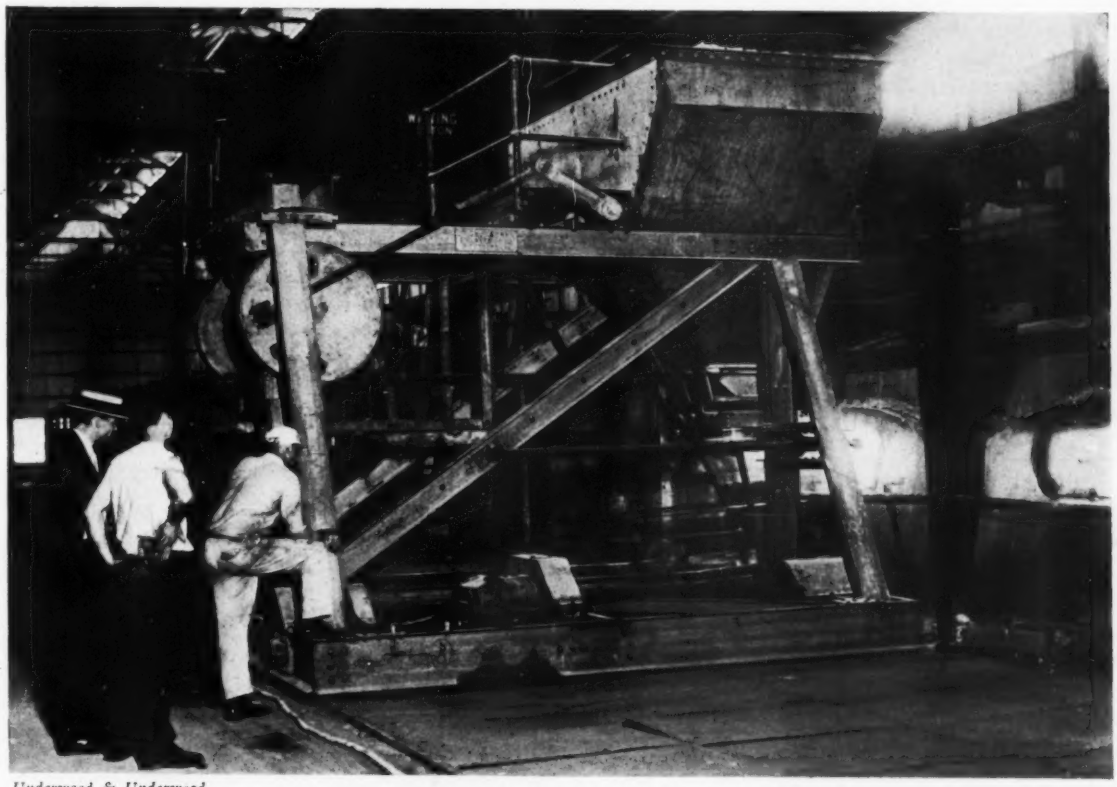
Referring back to the typical batch discussed at the beginning of this article, it may be of interest to carry this through an actual melting cycle. Details of operation would naturally vary in different plants according to individual preferences, kind of fuel used, character of pots, and general

condition of individual furnaces. The procedure outlined below is, however, eminently practical.

The furnace, a typical twenty-pot one, has been cooled to a casting temperature of 1850 deg. F. The pots have been removed, skimmed, emptied, returned to the furnace which has been maintained at nearly constant temperature, and the tweels mudded up. The furnace is now subject to wide open firing conditions. Stack damper and air are at the maximum. Since furnace and pots are relatively cold combustion is incomplete and smoke issues from every crevice. Under good conditions a temperature of 2400 deg. F. should about four hours when the batch is well along toward a state of fusion. If the furnace happens to be a fast one it may have to be checked a little to maintain schedule. Within eight hours from the first fill the temperature will have reached 2625 deg., the dips will show no white spots, being still a little rough, however, yet not at an open boil.

The Second Fill

Everything is now ready for the second fill. To simplify matters we will assume there is to be no third fill, and that the finisher directs the second. Enough batch will be



Underwood & Underwood

FILLING IN THE BATCH AT A MODERN PLATE GLASS PLANT

be reached in two hours, and, more important than temperature, the bottoms of the pots should show the same degree of whiteness as siege and sidewalls. We are now ready for the first fill. Some time during this two-hour period a ladle or two of cullet has been filled into pots that are new or known to occupy slow positions.

The first fill will be a large one, perhaps eight or nine ladles. The pot will be heaping full. There may be admixed cullet with the batch. No change has been made in furnace regulation, but the fire is clearing as the furnace heats up. Occasionally the fire is cut back a little during the fill. The temperature will drop from 100 deg. to 200 deg. during the fill, but, and this is essential, it should be back to 2400 deg. within two hours. From now on there should be recorded a steady increment of temperature, almost imperceptible at first, but increasing in magnitude after introduced to even up the pots, using somewhat less in those that are new, slow, or cut down. Again the loss in temperature accompanying the fill should be regained in less than two hours, and then the temperature will pick up gradually in the next two hours to 2680 deg. It should now be maintained constant for perhaps three hours, for now the glass is very liquid and plaining up. While it may be permissible to block an occasional pot the practice in general is a vicious one. Glass should not be disturbed while plaining up and when blocking and squirting water is resorted to it is quite certain that the batch is not properly compounded or that the finisher has not maintained his furnace at proper heat. The furnace, pots, and melting glass are now at full heat and it requires less fuel to maintain temperature so that the finisher has been gradually reducing stack and air and a soft, clean fire fills the hearth. If he

feels sure from the appearance of the dips that it is justifiable he may permit the temperature to drop a hundred degrees toward the finish to aid in plaining up. When the dips look clean, aside from scattering large bubbles, he will clean fires, make short reversals for a half hour, and then shut off. The time from the first fill to the finish will approximate seventeen hours.

Temperature Control

A word in regard to temperature control. No field of glass manufacture, with the possible exception of optical glass, requires such accurate knowledge of absolute temperatures. A variation of 50 deg. F. can spell disaster. Whatever control system is adopted, response to change of temperature must be quick, thermo-couple settings must be watched for spalling off of silica block, individual lags checked at regular intervals are essential, and correct supervision of the whole system important. It requires a high order of intelligence to interpret recorded readings in terms of true temperature. Each furnace must be treated as a unit. A thin crown, or an unusually heavy siege will affect distribution of heat, as will a clogged up checker condition, or the path chosen by the flame in traversing the hearth.

Common Defects in Plate Glass

A brief consideration of some common plate glass defects may be instructive. Ream, or cord, has been defined by someone as an invisible division plane between glasses of two different densities. It is always a resultant of variation in composition or variation in temperature. Batch changes of some material sort, or irregularity in cullet proportions will cause ream; and likewise erratic firing conditions resulting in quick, non-homogeneous melts, or too high viscosities, will often induce it. Since the causes are well understood, it rarely occasions much worry.

Another very prevalent defect, that may perhaps with propriety be classed as a special type of ream, is variously designated as string, drop, or knot. Appearing as minute yet readily discernible transparent areas, usually with a tail-like drag, and scattered in such a provoking manner as to prevent the cutting of large sizes, they present a serious aspect. Being visible though transparent indicates a density different from adjacent areas. Careful analyses have shown higher alumina content. That they come from the pot is generally conceded. Experience has demonstrated that they accompany high running temperature. In short, they constitute a hot defect. When the glass is very liquid and the pot wall white hot mutual solution of glass and clay result. The same phenomena have been repeatedly studied in tank operation. They invariably disappear when operating temperatures are lowered. It has been stated that pots having a tendency to squat show this defect most frequently. However, the writer has observed pots that were very rigid at 2750 deg. F. that yielded plenty of string. Why they always assume their characteristic form is unknown. The important thing, when you have them, is to decrease pot attack by softening fires and lowering peak temperatures.

Fine seed is always troublesome though the causes of it are well recognized. It is less damaging the finer it is. In general it indicates improper refining of the glass. Insufficient temperature, too much or too little soda, too little cullet, and fast running times are ordinary reasons for the presence of it. If possible, it should be eliminated without resorting to higher temperatures, which might develop string; or by resorting to blocking. Other contributing causes that may be influential in certain cases would include, making the first fill before the pots are thoroughly hot, weak pots, dry melts, casting heavy glass, and filling pots too full.

Bubble is the particular evil genius of the plate glass maker. It is always present, and illusive as to origin. There is rarely produced a finished plate entirely without bubble. When present in serious amount in any plant, there is never unanimity of opinion as to where it comes from. If we exclude the large, round air bells that are mechanically introduced during skimming and casting, the inquiry narrows to the variety somewhat smaller than these, less clearly of mechanical origin and having all the characteristics of the typical carbon dioxide blister; and that smaller in size, more obscure kind, known in the vernacular as the pin-head bubble. This last is some larger than the typical seed, less noticeably rounded, and without the characteristic double-wall of the carbon-dioxide blister.

Both varieties of bubble are more apt to accompany cold rather than hot operating conditions. When string and stone are predominating defects the pin-head variety is usually absent, and the carbon dioxide kind will be found in lessened degree, as would be expected. Since the former may be a resultant of incomplete decomposition of limestone or soda ash, result from gradual decomposition of sodium carbonate in excess into sodium oxide, or come from the charcoal, it is always necessary to study each individual case.

Underwood & Underwood
SPOTTING DEFECTS IN A SHEET OF PLATE GLASS

The writer has no conception as to the cause of the pin-head bubble, nor has any satisfactory theory been formulated, to his knowledge.

The subject of stones has been so thoroughly covered in published accounts that no exposition will be attempted here. Batch stones, crown drops, mineral crystallizations, and devitrification phenomena are of relatively rare occurrence. A discussion of pot stones, when not a concomitant of improper operating conditions, would bring up the whole complex subject of pot house procedure and choice of material.

The Art Glass of Leerdam

A Result of Cooperative Work by Artist and Craftsman

By K. Wasch*

The art glass of Leerdam represents a very special departure in the industry of the Netherlands, as it is the outcome of a constant and very close cooperation between the artist and the manufacturer. The honor of having laid the foundation of this cooperative work is due to one manufacturer, P. M. Cochius, president and manager of the Glassworks "Leerdam." He did this from a well considered idealism: to awaken the desire for beauty by the refinement of the objects of daily use, and to make possible the fulfillment of this desire to everyone. His efforts in this direction, begun about ten years ago, have met with great success. Not only have the products of Leerdam become widely known within a few years' time, Mr. Cochius has also succeeded in awakening such interest in his indeavors that a society of manufacturers and artists has been formed: the Society of Art in Industry, which brings together those of like minds, to further these principles. The Society has as its purpose to transform the factory product of every kind into a thing of beauty, and in this way to get the general public acquainted with articles made in good taste. Its further object is to enable the consumer to buy the beautified mass product. In November, 1925, the Society of Art in Industry organized a brilliantly successful exhibition, held in Haarlem. In the opening address, the chairman, Mr. Cochius, brought out the point that with the introduction of the artist in the factory entirely new possibilities have been opened up. He explained how the industrialists, members of the Society, have given to the artist a permanent place in their industry. The important feature was emphasized that whereas industry at first had only felt the need of associating itself with science, it has now been recognized that there is a need of furthering the social side of industrial work also. The conviction was voiced that those, who have given a place to the artist in their factories are certain that it will be only a question of time, until the artist in every industry, where he can be useful, will become as indispensable as the engineer and the welfare worker.

K. WASCH

After this introduction, which to us appears necessary to a full understanding of the methods, adopted in the Glass Works "Leerdam," we will proceed to describe how the Leerdam art glass is made.

In general two methods are followed:

1. The artist delivers his design and the factory produces the necessary molds and takes charge of the manufacture of the object. In this way the beautified mass product is made, and the cooperation of the artist and the manufacturer is assured, inasmuch as the designer, through study of the demands of the material and through inspection of the models has convinced himself that his conceptions have been carried out in detail.

2. The artist stands in the factory side by side with the glassmaker, and gives his directions during working. In this way the "Leerdam Unica" (plural of the Latin "unicum") are formed. They have the distinction of being really unique, in other words, not one object is the same as another, which is attained by making use of variations in form, color, shade, surface treatment or ornamentation. This method of working enables the artist to follow his inspiration directly; to make any experiment which occurs to him, and in this way leads to ever new and surprising procedures. It is the ancient handicraft, which here lives again in modern form.

It will be clear that the art glass made at Leerdam is primarily handwork, and that reference is made here to so called mouth-blown articles. Only when pressed articles are made (such as the breakfast service and coffee set, shown on another page) they must be made by the well known semi-automatic processes.

The glass is melted in old fashioned Boetius furnaces, as well as in very modern chamber furnaces, made according to the system of the Swedish engineer A. Hermansen. The Boetius furnaces are cone shaped, and end in a chimney. They contain about 14 pots, set in a circle. The pots are about 1¼ meters high. The heating is done by direct coal firing, the flames pass over and between the pots. From 20 to 24 hours are required to bring the batch to the desired temperature of about 1,400 degrees centigrade.

The chamber furnaces, system Hermansen, are gas fired and have smaller pots, usually only eight. These furnaces are recuperative. The burner is located in the center of the furnace; the products of combustion are drawn through openings, located under the supports.

The following methods of decoration are in use:

CUTTING. This is done by means of iron or stone disks, upon which trickles a thin stream of water, mixed with very fine sand. First the surface to be decorated is roughly ground. It is then polished with a round brush, fixed on a disk, made of wood, cork, felt or leather. For very simple cutting a machine can be used. Otherwise all the work must be done by hand.

ENGRAVING. This was done formerly with quartz, emerald or diamond, but is done at present with very small copper wheels. It is done exclusively by hand, and requires great skill.

ETCHING. The glass is covered with a protective layer of

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wax, on which the design is drawn. The objects are then immersed in a bath of hydrofluoric acid which acts wherever the glass surface is exposed. For mass production apparatus such as the "pentagraph" is used, by which any desired pattern is reproduced into from 6 to 24 objects at the same time, and which can be operated by a single unskilled workman.

SANDBLASTING. This is also done by machinery, by blowing a rapid stream of sand against the glass surface. The parts which are to be protected are covered with stencils.

CRACKLING, the making of an irregular network of lines, located inside the glass body, and "optic" glass, having lines along the length of the glass, either straight or bent, are both accomplished during the process of making the glass object. Crackling is the artificial breaking up of the glass layer, located directly below the surface.

PAINTING. For this purpose, easily fusible glasses are used, which are finely ground, and mixed with volatile oils, like paints. The painted object is heated slowly in a muffle oven to a red heat, the oil disappears and the glass powder melts together with the surface, to a single colored layer. Practically every desired variety of decorative effect can be obtained, since modern technology provides a complete glassmaker's palette of the necessary fusible paints. including gold and silver.

LUSTERING. This is done by dipping the glass article in solutions of metallic resinates, or by painting the objects with such solutions. After drying and heating, a thin layer of metallic oxide remains on the glass surface. The peculiar color, produced in this manner is caused by interference of light in very thin layers. The same effect is obtained by chemical means as that which is caused by "time" through weathering.

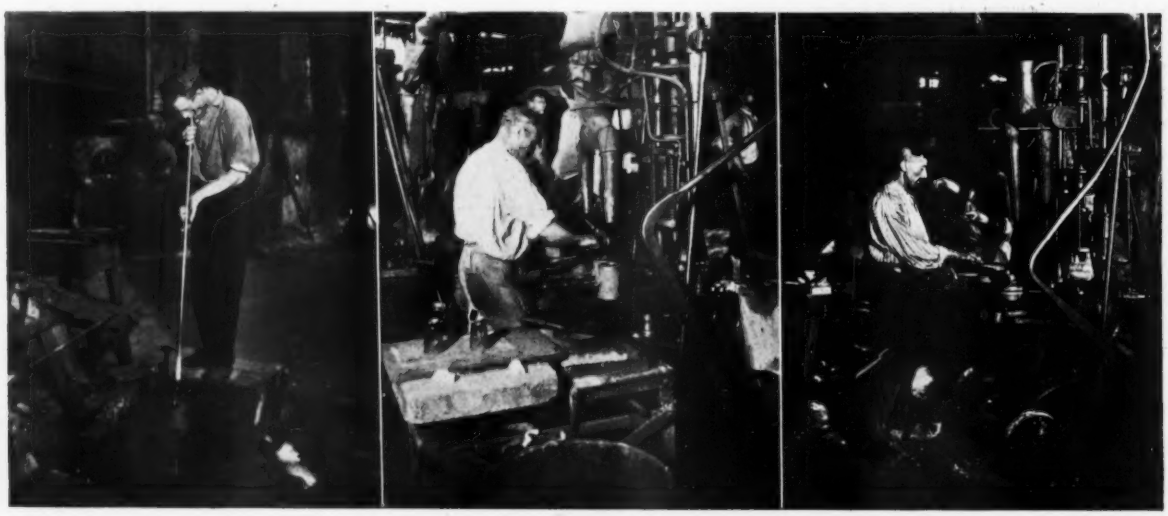
As stated above, the making of "Unica" gives rise to a great many new discoveries, also of a technical nature. For instance all sorts of new surface treatments have been found, very remarkable iridescent effects, not on the surface of the glass, but in the mass, and many beautiful shadings have been discovered. Without colored photographs, however, it is difficult to give an adequate description of this kind of glassware.

Space does not permit giving a full account of the esthetic principles which have guided the most prominent designers of Leerdam glassware in their work. In a few words, it may be stated that they aim at a reestablishment of the original and natural beauty of glass, with regard to line and form. Beauty and usefulness are combined. The glass is therefore no longer simply an article of daily use, but also, it is not merely a pretense, a background for illogical ornamentation.

These precepts, therefore, are a reaction against the Bohemian methods of decoration, which often demands very rich and overloaded decorative designs, in cutting and engraving, and done after conventional models.

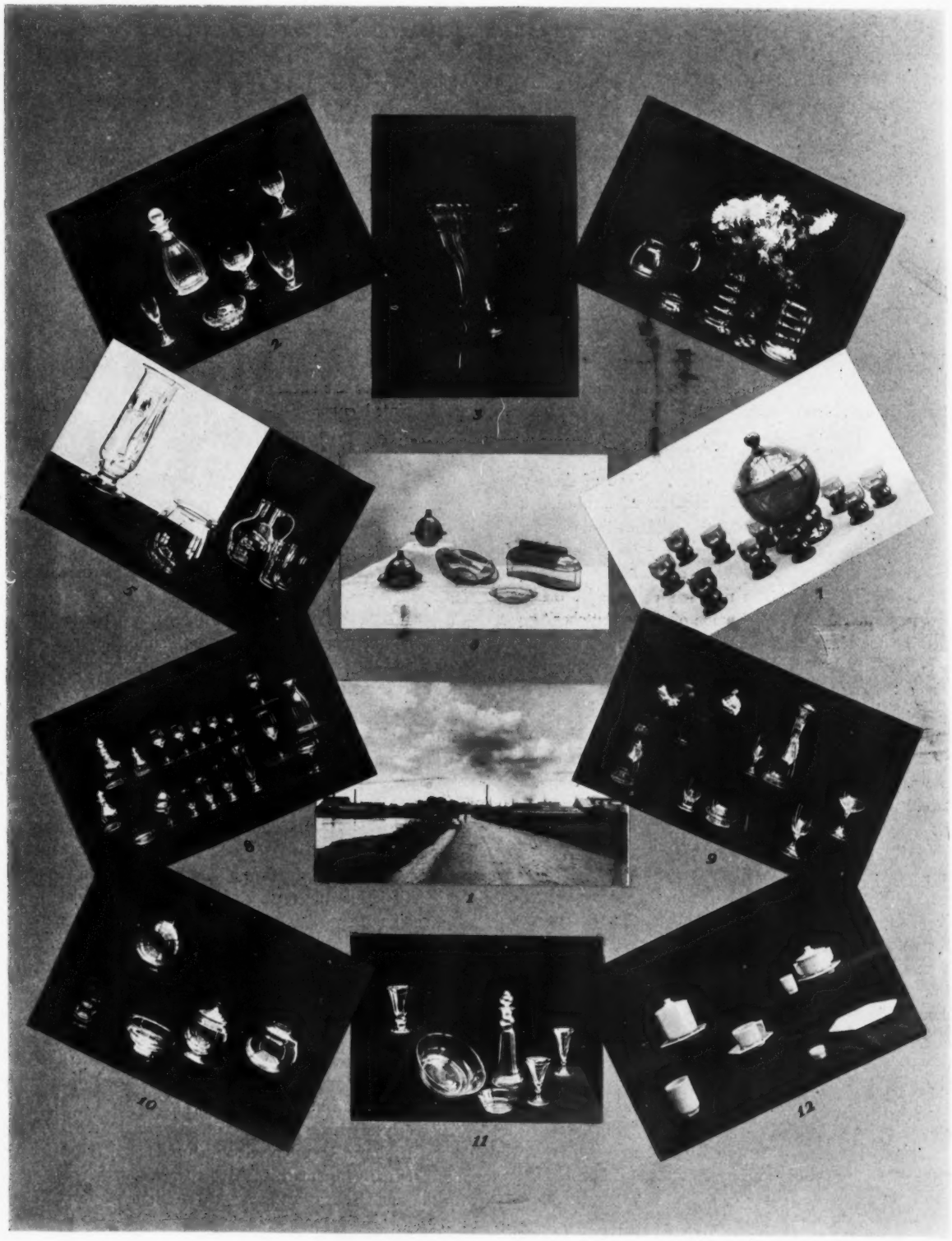
It is of interest to note that the Leerdam art glass is sold in commerce under the name of its designer. For this purpose, each object is provided with a special etching stamp, and the initials of the artist responsible for the design etched indelibly upon it.

Those who are working, or who have worked for the Glass Works "Leerdam," have already made a name for themselves in other lines of art. Reference is made for instance to K. P. C. de Bazel, a prominent architect (died 1923) who built many homes in the suburbs of Amsterdam, and who designed the new building of the Netherlands Commercial Company of Amsterdam. Another designer of note is Dr. H. P. Berlage, an architect of world renown, well known in America, where he has given lectures.



GLASS BLOWING AND PRESSING IN HOLLAND

Others are C. J. Lannooy, the ceramic art designer, and C. de Lorm, a craftsman of The Hague, of excellent reputation; A. D. Copier, art designer and commercial artist, who is permanently retained by the Glass Works "Leerdam," and who is one of the most advanced of the younger artists; Jaap Gidding, designer of decorative tile, who for many years was connected with the well known mosaic works of van Puhl & Wagner, of Berlin.



The Modern Art Glass of Leerdam

1. GLASS WORKS "LEERDAM" (Factory on right side of road)
2. CUT GLASSWARE, DESIGNED BY K. P. C. DE BOZEL
3. ANNUAL CUP, 1926, DESIGNED BY DR. H. P. BERLAGE (Color amethyst)
4. VASES DESIGNED BY K. P. C. DE BOZEL
5. PAINTED GLASS DESIGNED BY JOSEPH GIDDING
6. PRESSED BREAKFAST SERVICE DESIGNED BY K. P. C. DE BOZEL
7. BOWL WITH GLASSES, DESIGNED BY C. DE LORM
8. STANDARD SERVICE, DESIGNED BY C. DE LORM
9. SERVICE, DESIGNED BY A. D. COPIER
10. GLASSWARE, DESIGNED BY C. J. LANVOY
11. GLASSWARE, DESIGNED BY K. P. C. DE BOZEL
12. PRESSED COFFEE SERVICE, DESIGNED BY DR. H. P. BERLAGE

Temperature Gradients in the Fabrication of Machine Blown Glassware

By Roy E. Swain*

In the thirty-five or forty centuries devoted to perfecting the art of working glass on the blowpipe glassworkers have learned a great deal about how to take advantage of and how to utilize the best qualities of the material with which they work.

In the thirty-five or forty years of glass-blowing machine development a great deal has been done to learn the mysteries of glass. The results have been so encouraging that today numerous groups of men are working together for the sole purpose of solving these problems, where but a few years ago men single handed were spending their spare time trying to improve the methods then in use.

Many attempts were made to build machines that would duplicate the work of the glassworker. None of these were entirely successful, but quite a number of semi-automatic machines were built that partly replaced the workmen.

Others have been bolder and have applied themselves to developing new methods that are more easily adapted to mechanical appliances. The products of some of these attempts have well deserved the name of "glass butcher" given to them by the glass workers of the old school. Others have been able to develop machinery that produced a superior, as well as a cheaper article. This has been particularly true in the container field where uniformity is an important consideration.

When the manufacturer of lighting goods, tableware, and other wares used for decorative purposes tries to adopt these container making machines and methods to the manufacture of his wares, he finds that only under the most skillful supervision is he able to produce a satisfactory product. Many have given up in disgust, fully convinced that only the coarser utility glassware can be produced by machinery, while others have gone about devising methods of covering up the defects of their wares and have succeeded in building up a profitable business.

However, this condition is only temporary as a great deal of thought is being given and work being done to create machines capable of producing glassware of good appearance and faultless quality. It is only a matter of time until machines will be designed, capable of taking advantage of the best working qualities of glass, delivering a product not only more uniform in size, shape, and weight, but equally as good in execution and appearance as the hand-made ware.

It would be impossible to consider all the different factors that enter into the production of a blown glass article in the space available. However, we may take a few well known methods of machine blowing and try to analyze them in relation to that quality in glass which gives it increasing viscosity with decreasing temperature.

Perhaps the first attempt to break away from the traditional way was the press and blow. This method was first carried on by hand operated equipment, later became semi-automatic and still later full automatic by working the machines in connection with feeding devices.

The feeders all consisted of some kind of flow device, the first of which was a cup for collecting the glass flowing through an orifice in the bottom of the tank or forehearth, and a shear for severing the stream at the proper interval. There were numerous modifications of this cup and shear arrangement. In some the cup was below the shears and in others above the shears. Some used sleeve type cups and others jointed cups.

No matter how they were arranged they all had numerous drawbacks as the glass flowing into the cup folded back and forth, creating laps, blisters, chills, and other defects. This glass when pressed in the blank mold produced a blank full of hot and cold spots that would reheat accordingly.

The blown ware was optical, due to the uneven distribution caused by the hotter parts of the blank blowing out lighter than the colder spots.

A great deal of money, time and patience were spent trying to make lantern globes, shades, and similar ware by this method, but they were so unsightly that only a limited number of them ever found a market.

In the meantime the pulsating feeder was developed, and with the solid, well-shaped gob from these feeders the press and blow made remarkable advancement, making the greater part of the semi-automatic jobs into full automatic, and opening up new fields.

Still the manufacturer had his problems for unless the feeder was worked at high speed and the glass was kept hot, the lower end of the gob was noticeably colder than the upper end. This is just the reverse of what the glassworker would wish, so it not surprising that a number of means were devised for turning the gob end for end, so as to throw the hotter end into the bottom of the blank mold. These cures were generally worse than the disease, for the cups, slides, etc., used to perform the trick, deformed and chilled the gob so greatly that their purpose was defeated.

Others took advantage of the gob feeder by using the type of blank mold having the finish in the bottom, pressing or blowing the glass into the neck ring.

The early machines had to contend with the quick-setting glasses developed to promote rapid production for the hand shops. Usually the machines had to work at the same tank with the hand shops, resulting in conditions unfavorable to both.

Much was done to improve the press and blow, and several types have been developed each having its special advantages.

The two-table press and blow machines produce a greater variety of uniformly better ware than the other type. These machines are clumsy and require more help or a complicated and often unsatisfactory transfer device. To offset these

* Engineering Department, Macbeth-Evans Glass Co., Charleroi, Pa.

disadvantages they have greater working flexibility, as the operator has a much better opportunity to time the blowing to take advantage of the best reheating schedule.

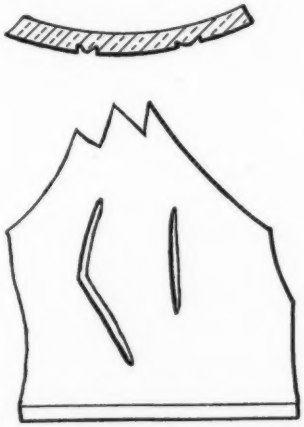
The single-table machine mounts both blank molds and blow molds on the same table, usually on the same radius, so as to swing the transfer device about the center column of the machine. This machine is more compact and less complicated than the two-table machine but not so flexible, as the reheating and blowing time is governed by the indexing of the blank molds.

A still more compact machine is the telescopic blank press and blow. Due to the blank mold having to come up inside the blow mold, only certain shapes of ware lend themselves to manufacture on this machine.

The semi-telescopic machines were developed to produce ware not adaptable to the full telescopic machines. In these machines the neck ring is separate from the body of the blow mold permitting the mold to remain open, making clearance for the blank mold during the pressing.

In all these machines certain operations are performed in the same sequence. First, the gob or charge of glass is placed in the blank mold. Second, the blank mold is removed to the pressing station and the blank pressed. Third, the blank is removed from the blank mold and enclosed in the blow mold. Fourth, a certain amount of time is allowed for reheating. Fifth, compressed air of sufficient pressure to blow the blank to the size and shape of the blow mold is admitted.

Certain problems and defects are common to all press and blow operations. As explained, the lower end of the gob is usually colder than the upper. This end is crowded into the lower part of the blank mold where the smaller cross section causes greater heat radiation and still faster cooling,



RUPTURE OF OUTER SKIN

producing an even greater temperature gradient. Then when the plunger descends into the glass, it displaces the hotter central core. This more liquid glass naturally is pressed into the upper part of the blank. Here we have a temperature gradient that is just the opposite of what the glass worker strives to obtain. The fact that the larger end of the blank is uppermost and that the blank is practically the full length of the mold compensates for this reversed temperature gradient.

When the blank is removed from the blank mold it is apparently set and can usually be thrown upon the table and rolled about as a piece of finished ware. If watched it will be observed to brighten up and start to flatten out. To one whose eyes are unaccustomed to judging the temperature of molten glass this reheating is best seen by observing the reheating of a heavy piece of press ware made of some dark color such as blue, green, or purple. When the plunger is withdrawn the ware will have a cold appearance, but it soon brightens to a bright red then more slowly changes back to the natural color of the glass. Very light articles may not retain enough heat to reheat the skin and no change will be noticed.

When the blank is pressed the plunger is held down long enough to give the blank the proper set. The set varies with different articles and the condition of the glass. Set refers to the skin of chilled glass that covers the blank inside and out.

A blank that has not enough set will reheat so rapidly and completely that the reheated skin will not support the blank, so that it falls away, resulting in a very light upper section of ware.

A blank that has too much set will not reheat enough to blow.

The blowing pressure required for blowing pressed blanks is usually quite high and a number of defects are caused by this. To get the best possible product the glass must not be forced, but allowed to slowly accommodate itself to new conditions. When too great pressure is brought bear on the blank the weak sections are strained to the breaking point. This results in an uneven distribution, an inferior and unsightly article. When the outer skin has not reheated sufficiently it is often ruptured, usually in the lower section where the skin is heaviest. This rupture is shown enlarged in the sketch; the sectional drawing shows how the skin has been torn apart and the more fluid glass forced out through the opening.

Another very similar defect is caused by using an air pressure great enough to slightly spring the molds. This may cause a rupture, the separation being so small as to look like a break or crack, but close examination will show that the inner surface is still whole.

Often it is difficult to distribute the cooling wind about the blank molds, and the blanks will be set slightly more on the side from which the wind comes, causing that side of the ware to be noticeably heavier than the opposite side.

In the making of press and blow paste mold ware, even greater difficulties have been encountered. The cold paste mold makes a poor reheating chamber as compared with the "hot mold" or "iron mold." In the first stages of development the quality of the product was so poor that the experimenters tried to introduce other steps and equipment into the process. The glassworker naturally turns back to the fire and different methods and equipment were devised for use in "warming in" the blanks.

One of these is to press the blank in a ring similar to the neck ring or transfer ring used in other methods of working. By means of this ring the blank is manipulated in the fire to take away the chill imparted by the blank mold.

Another method is to "catch up" the pressed blank in a hollow handled snap. By means of this snap the blank is warmed in and then blown manually or in a blowing machine the same as a blank of glass prepared on a pipe. Sometimes instead of using a snap the blanks are stuck up on a hollow-handled punty or post.

In most cases this ware has an advantage over pipe-blown ware as it requires no finishing, being selected and packed as it comes off the lehr. Also the pressed finish is more uniform and has a better appearance than the ground finished.

Another type of machine presses the blank directly into the chuck or blowing head, and a flame is applied to the blank to reheat it. This blank is pressed in a manner that prevents the formation of a heavier skin at the apex than at the base of the blank. The variety of ware made on this machine is small as only a few ounces of glass can be successfully manipulated in this manner.

In these methods of "warming in" blanks for paste mold ware the greatest amount of heat is applied to the point of the blank so that the "warmed in" blank possesses a temperature gradient similar to that of the blank fashioned by the glassworker on the blowpipe.

Another automatic machine making light paste mold ware obtains its charge of glass by a suction method. The charge of glass is placed upon the end of a spindle or blowpipe, puffed, elongated and blown in a manner that seems almost human. This blank is also free from the cold tip and is placed upon the spindle in such a manner that the base acquires a set that gives the blank a temperature gradient only slightly different from that of the hand-prepared blank.

In general the machine blown glassware intended for decorative purposes is inferior in workmanship and general appearance to the hand-made ware. By the use of sand blast, cold and "burned on" colors, cutting, and so forth, these defects are hidden, and a product is placed on the market at a price that permits of the use of an abundance of glassware in homes that otherwise would be comparatively bare.

However, the quality and variety of this particular line is being constantly improved, as the machine designers and operators gain a better understanding of the subtle properties of the molten glass, and adapt their equipment to take advantage of them.

EDITOR'S NOTE.—This is the second article of a series, written by Roy E. Swain, of the Macbeth-Evans Glass Company's Engineering Staff, giving such minute details of the operation of automatic machinery with regard to the properties of molten glass, as are accessible only to the expert. A third article will appear in an early issue.

Duties of the Purchasing Engineer

By W. S. Mayers*

There are many employees holding the title of Purchasing Agent but with the exception perhaps of those in very large manufacturing establishments, few of them are purchasing agents in anything except the name.

It is true that certain articles such as nails, screws, standard steel pipe and fittings, common brick, concrete materials, common bar iron, common sheet iron, brooms, electric lamps and office supplies may be purchased intelligently by an office man, but even some of these articles may, at times, require specifications which he is unable to supply.

For managers who hold that purchasing agents need no technical training it is suggested that they take a catalogue of a large supply jobbing house, go over the index item by item and from the thousands of articles listed therein select those which, in their opinion, an office man without technical or practical training would be qualified to purchase without assuming undue chances for errors.

The result of this test may be a surprise to many and it is well to admit that expert buying requires just as high a grade of intelligence and training as does expert selling.

The selling department is usually highly organized with a personnel which is generally well paid and rightly so. In any exchange of goods for money the burden of proof as to quality and fitness rests upon the seller. If he is specially qualified on his side of the deal, is not the buyer at a decided disadvantage if he is not equally qualified? There is a buyer for every sale and the volume of business is precisely the same on one side as it is on the other in the final summation of all classes of business. No manufacturer can of course buy anywhere near as much as he sells, unless he classes labor as a commodity, but his total annual purchases including fuel amount to a large percentage of his operating expenses.

Can it, then, be maintained that a manufacturing concern should have as its purchasing agent a qualified engineer or technician? The answer is yes if there exists no engineering department or other means of obtaining technical information. The larger companies usually have in their employ at least one qualified engineer and in this case it is he, and not the man with the title, who is the real purchasing agent. Therefore in the remaining part of this article the title of purchasing agent will be abolished and the purchasing engineer substituted therefor.

In the common run of affairs it is quite safe to say that the salary paid to the purchasing engineer, when compared to the amount of money disbursed under his supervision, is always very inferior to that paid to the personnel of the selling department as compared with the total amount resulting from sales. There is no apparent reason for this

*Consulting Engineer, Fairmont, W. Va.

discrimination and it must be set down as purely psychological. As an illustration take the case where, in a ten thousand dollar sale, the sales department by skilful effort pulls down a net profit of a thousand dollars over the amount which it was thought could be obtained. This is money coming in unexpectedly and looks like mighty good work to the manager, and so it is.

But take, on the other hand, the purchase of necessary factory equipment by the purchasing engineer, who has by carefully prepared plans received several competitive bids and thus lowered the purchase price a thousand dollars below that of the bidders who had found favor in the sight of the manager and who would have received the order in the absence of the engineer. Does this saving look as big to the manager as the same amount turned in by the sales department? The chances are, by and large, that it does not, although it is made of the same kind of "velvet" and affects the balance sheet just the same in both cases.

There is an old adage that "a penny saved is a penny earned" which needs a little revision. A thousand dollars saved in factory operation is better than a thousand dollars earned, for in the saving no capital investment is required.

Cases are not rare in which the technical departments in factories have indisputably prevented managerial blunders involving very large sums of money, in some cases the saving amounting to many times the salary of the technical man during the whole period of his employment. He must not expect, however, to be handed the difference in a big fat envelope and should be contented with a gruff "thank you," like the man who receives a dime as a reward for returning a lost diamond ring to its owner.

Returning to the subject of the purchasing engineer he has an important lieutenant in the person of the factory storekeeper who looks after the stock of supplies in general. Here again there is needed some degree of practical knowledge in regard to factory operation and requirements.

The storekeeper need not be a college graduate but he ought to have a fair knowledge as to the needs of each operating department, especially in reference to expendable articles, such as oil, grease, waste, bolts, pipe fittings, electric supplies and a large list of other articles peculiar to the situation. His value to the company will be much enhanced if he is able to estimate in advance upon the probable requirements for supplies and minor replacement parts for machinery for a given period, thus enabling him to make proper anticipatory requisitions for these materials. Materials for making major repairs to machinery and emergency material are best handled directly by the purchasing engineer and need not be listed nor accounted for by the storekeeper.

If requisitions for supplies are originated and made by foremen or heads of departments they should in all cases go to the storekeeper first in order that he may supply the articles from his stock if possible. It is a better plan for each head of department to make his wants known by means of formal orders upon the purchasing engineer or the storekeeper who will then make the necessary requisition, noting thereon for whom the material is ordered and the proper account to which it is chargeable.

All requisitions will naturally be passed to the general manager or factory manager for his approval and finally to the clerks who make out and mail the orders and keep the records pertaining thereto.

Bills payable are commonly first examined by the manager or auditor and then checked up with the orders. On each order there should be a notation giving the name of the department for which the material is intended as well as the initials of the maker of the requisition.

The storekeeper should be the custodian of all the larger tools for general use, such as portable hoists, jacks, emergency pumps, testing apparatus, large hand tools of all descriptions and certain kinds of spare machines, and should exact a receipt from each employee receiving such tools, charging his account with their values until they are returned or accounted for. Many factory managers require that each employee shall furnish his own small hand tools as it is found to be an almost impossible task to keep an adequate record of them when loaned out.

In the smaller factories the full time employment of a high grade technical man and a comprehensive system for handling orders and supplies might not be justifiable, but correct buying is just as important for them as it is for the large factories.

In medium size factories the engineer usually has, in addition to his duties as purchaser, many other lines of work requiring technical knowledge, such as the designing and superintending the work of additions to and alterations in the plant, making inspections and recommendations, designing and constructing special machinery, supervising machine operation, correcting wasteful practices, auditing of the larger bills payable such as those for fuel, electric power, water and important items in machinery and supplies as well as a multitude of other items of lesser importance.

The manager of a large or medium size factory has a complex job on his hands the details of which would make a long story.

It is not the purpose of this article to attempt the presentation of standard rules for guidance but it is hoped that some pertinent points in reference to purchasing departments in general may have been brought up.

In a discussion of annealing the first question was the rate at which heat was dissipated by glass at the various temperatures of the annealing process. The second—but not necessarily in order of importance—was the thermal expansion or contraction of the material. An average value of the thermal linear expansion coefficient for glass was 0.000,-008.5. Thermal conductivity was the third question that required discussion. An average value of the conductivity was about 0.002. Copper had a conductivity 500 times as great. Glass was more liable to crack when heated rapidly than when cooled at the same rate. The other conditions determining the magnitude of the stresses that might be established in glass during the cooling process were:—(4) cohesion of the material, (5) the viscosity of the glass, (6) the existence of a surface layer having properties different from those of the underlying material, (7) homogeneity of the glass, and (8) the form and dimensions of the glass.—*Dr. J. W. French at Society of Glass Technology.*

Glass Industry

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The Twenty-Fifth Anniversary of the Bureau of Standards

The commemoration of the twenty-fifth anniversary of the establishment of the National Bureau of Standards, held on December 4th just past, has been the occasion of expressions of appreciation of the valuable work of this institution from every quarter of the land. The address of Secretary Hoover, printed elsewhere in this issue, is one of unstinted praise, with which all who have knowledge of the Bureau's work will heartily concur.

There is scarcely any branch of industry which has not in several ways been aided and influenced by the scientific work of this institution. The glass industry recognizes and acknowledges the generous support received from the scientists of the Glass Division. Reference is made to the splendid work on the manufacture of optical glass, the studies of tank block corrosion, the manufacture of special pots for the making of optical glass, the studies of tank control and devitrification, annealing and numerous other subjects of vital concern to the glass manufacturing industry.

Aside from the direct support which the industry is receiving from the Bureau, it has served as a training school of men now engaged in actual glass manufacturing, or in charge of scientific work fostered by a number of glass manufacturing concerns. These men, who count among their number some of the ablest scientists engaged in the industry, are carrying out the principles and ideals of the Bureau of Standards, which in this manner reaches out into every phase of glass manufacturing.

Chromium Coating of Glass Molds

Every industry using metals in any way is concerned with problems of corrosion. Industry is making constant warfare on rusting and while all manufacturing processes have some problems in common, there are no two industries that are confronted with the same difficulties to overcome.

Corrosion is the great enemy of metals. No definite figures are available as to the extent of its destruction, but it is estimated that no less than a billion dollars' worth of property is annually lost due to the tendency of metals to turn to rust.

Present day investigations are leading toward the development of two means of protecting metals against corrosion: electroplating and the manufacture of rust-resisting alloys.

Corrosion at high temperatures proceeds faster than in the cold. For this reason the corrosion of metals exposed to the high temperatures incident to glass manufacture is one of the most troublesome problems with which the glass industry has to deal.

In the manufacture of window glass by the Libbey-Owens process the sheet of glass, as it emerges from the drawing pot, passes over a roller made of monel metal, a corrosion-resisting alloy of about 70 per cent nickel and 30 per cent copper. However, when pure nickel or monel metal are used to make molds for pressed glassware it is found that these metals are not suitable for this purpose. Rust-resisting chrome steel is too hard to allow proper working of the

surface, a necessary condition for the production of glass molds.

Molds of cast iron are most easily worked, but show considerable surface oxidation. The pressed glass industry is one of mass production. Large output means rapid decay. Rusty molds must be cleaned and polished, which causes the original sharp outlines of the design to be blurred if the cleaning is repeated often.

Experiments now in progress on the coating of molds with metallic chromium by an electrolytic process, promise to give a solution of some phases of the mold problem. Chromium is extremely hard; it cannot be scratched by glass. At ordinary temperatures it is completely resistant against rusting, like gold or platinum, and in this respect it is the equal of the noble metals. These properties make it especially adapted to use as a coating of the inner surface of glass molds, made of ordinary cast iron.

While there are still a number of difficulties to overcome, it is believed that further research will succeed in eliminating them. Cooperation between the mold maker and the expert electroplater is required to bring this problem to a satisfactory solution.

Technical Consultation Service

THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility the GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions than those printed are invited to submit them. All inquiries will be considered confidential.

Chromium Plating of Glass Molds

QUESTION 104. We have read with much interest your article entitled: "Can Glass Molds be Coated With Chromium?" which appeared in the August number of THE GLASS INDUSTRY, and may say that lately we have been experimenting ourselves with chromium coatings on molds.

In the introduction of the article, it is stated, "These properties of chromium have proven of great interest to other industries as well as the metal fabricating industry, including glass and rubber industries." From this we conclude that more has been written on this subject, and we should be obliged if you could let us know in which journals, and when, articles have appeared on the coating of glass molds with chromium.

ANSWER: As far as we know, the article referred to is the only one that has discussed the chromium plating of iron and steel molds used for fabricating purposes in the glass industry. The application of chromium to molds in America is still in the experimental stage, but we anticipate later on giving our subscribers the results of some experiments which to our knowledge are now being made.

It is not advisable to deposit too heavy a coating of chromium upon the molds. The following formula has given satisfactory results:

Water	1 litre
Chromic acid	120 grams
Chromic sulphate	7½ grams
Boric acid	6 grams
Chromate of iron	7½ grams

The latter is used in a finely divided state, similar to that used in the ceramic field. This solution should be used at 10 to 12 volts and 300 to 400 amperes per square foot of surface area, and should give a sufficient thickness of chromium deposit on the molds in thirty to forty minutes. It is suggested that chrome steel containing not less than 20 per cent chromium, be tried out as anodes.—C.H.P.

Hoover Extols Work of Bureau of Standards

The completion on December 4 of a quarter century of service by the Bureau of Standards at Washington was made memorable by the staff keeping "open house" on that day. Old friends, former members of the bureau forces, and others who desired to become better acquainted with the staff and its activities to the number of about 1,500 visited the laboratories. A luncheon was served and in the evening a dinner given by the staff at the New Willard Hotel was attended by about 450 members and guests.

Dr. George K. Burgess, director of the Bureau, was toastmaster. Secretary Hoover of the Department of Commerce addressed the gathering and other speakers were Dr. Frank A. Wolff, a charter member who commenced his work in 1897; David Lawrence, president of the *United States Daily;* Senator R. B. Howell; George B. Cortelyou, formerly Secretary of Commerce and Labor; Congressman William B. Oliver and Dr. S. W. Stratton, the first, and for 22 years, Director of the Bureau.

The address of Secretary Hoover follows:

Dr. Burgess, employees, and friends of the Bureau of Standards, it is my privilege to welcome you on behalf of the Department of Commerce and more especially to extend a welcome, and express our gratification at the presence here of more than 200 representatives of other institutions engaged in the great problems of science, and more particularly also, we have the privilege of welcoming here the first Secretary of Commerce and Labor, under whose great skill and organization the firm foundations of the Bureau of Standards were first laid; and we have also with us the first Director of the Bureau, Dr. Stratton, to whose devotion and capacity we owe more than to any other man, the development of one of the world's greatest scientific institutions.

It is not often that we may find the birth, the growth and development of so great an institution in so short a period as a quarter of a century, and that we may find it within the lives of most of us who are here present. This Bureau today represents the greatest of all the world's physical laboratories. It has contributed probably more than any other of our scientific institutions in its special field of development of standards, the development of precision in measurements, and precision in thought, for while science is the growth of knowledge in the fundamental laws of nature, we can make no progress in science unless we may have that development of precision in thought and the determination of accuracy in measurements. We find that the foundation of all scientific progress must be always step by step in the development of terminology, the definition of terms, and as I said, above all in precision of thought and precision of measurement.

Now the Bureau has not confined its activities alone to that field for during the progress of its growth it has extended its activities and its efforts into the great field of scientific research, and it is in research, in the development of scientific thought, in scientific experiment, that we must find the roots of the industrial progress of our time. If we were to recount the development of our modern civilization, its real counting would lie in the development of science itself and in the undertaking by the Government of the creation of so great an institution as this. With so royal support as it has had at the hands of the American people and its Congress, we find the real expression of our time, the desire of our people for the development of fundamental laws of nature for therein lies the root of our further progress.

I know of no laboratory, no effort of any government that represents so liberal and so generous a support to science as is exemplified in the Bureau of Standards. Today its appropriations approximate two and a quarter million dollars a year, a larger income than most of our universities, an income probably not exceeded by more than five or ten of our great educational institutions, and it all marks an appreciation of the importance of science as a contribution to national progress.

There is no need for me to talk of the Bureau's importance in scientific research and discovery to a body of scientific folk, but I am impressed with the fact that we are a people of 110,000,000 on a continent where we have already developed the large proportion of our national resources, a population growing at a rate that we must face in the next fifty years, doubling up to perhaps two hundred million people. We must face the solemn economic fact that unless we develop through science the greater utility of our resources, expand by discovery their usefulness, we can not

maintain the standards of living of that vast increment of population to those standards that we now enjoy.

Dr. Malthus a century ago brought forth a theory, with which you are all familiar, that an increase of population would be met with pressure on subsistence which would defeat its own purpose. The Malthusian dectrine has not proved true. It has not proved true due solely to the development of science and the discovery of its applications, and today we are just in that same race of population and science. It is only through the support of agencies of this character, and hundreds of other institutions engaged in scientific research, that we may expect with confidence that as our population grows we can still add this increment of comfort and luxury which we in this country have enjoyed in the last century.

But science has more to it. It stands for far greater things than purely material benefits. Research, development and engagement in science is an engagement in the elaboration of truth, the discovery of truth. It is a process of improvement in the veracity of man and precision of thought, and those indeed are spiritual benefits, for from the truth, the development and science of truth in our people, must come an appreciation of those things that lie in the realms of the imponderable and that lie out of the range of the material in life.

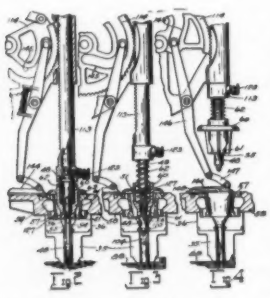
Now I can not close even so brief a statement as this without reference to the devotion to the ideals of science and devotion to the ideals of public service that have been shown at every step in the growth of this great Bureau. Its officials, its workers, have shown a willingness to public service at great personal sacrifice, extending, many of them over long years. It is one of the finest tributes to American life, and theirs is the life that at least has been enriched with association with great things and great thought, and theirs has also been a service which enriches the lives of all of our people; and to our guests, we appreciate your coming here on this twenty-fifth birthday of this institution because it is to us the greatest of all compliments that men of science and technology from all parts of the United States should journey to Washington to bear their testimony that this has been a great and useful institution in the realm of labor that they engage thmeselves upon throughout our great land.

Recent Patents

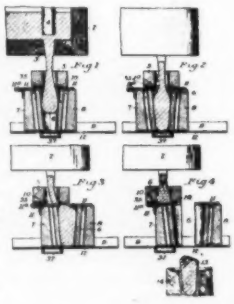
NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

GLASS-BLOWING MACHINE. U. S. 1,607,651. Nov. 23, 1926. Leonard D. Soubier, Toledo, O., assignor to The Owens Bottle Co. Filed 2/23/22. In machines in which the charge of glass in a blank mold is transferred to a finishing mold, chilling of the glass makes it necessary to use a sufficient quantity so that when blown in the finishing mold the walls of the article are comparatively thick and the article heavier than is desirable. An object of this invention is to overcome this difficulty and to enable small bottles or vials to be made with the walls thin and the weight of the articles as light as desired. In the attainment of this object the charges of glass are introduced into suitable molds by suction and blown therein to their finished form without the necessity of transferring the partially formed article from one mold to another. Fig. 2 shows the mold in gathering position. Fig. 3 shows the relation of the parts after the charge has been severed and drawn upward in the mold. Fig. 4 shows the bottle blown to hollow form in the mold.



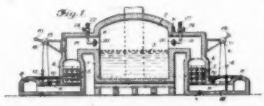
APPARATUS FOR FEEDING GLASS. U. S. 1,608,326. Nov. 23, 1926. Harry B. Lawson, Huntington, W. Va., assignor by mesne assignments to Ball Brothers' Co. Filed 10/14/22. Glass-forming apparatus, comprising a source of molten glass having a flow opening, a receiver adapted to receive the glass and preform the same, such receiver being tapered toward the bottom, means for severing the stream, means for discharging the severed gather, an open bottomed receiver above the preforming receiver for collecting the glass during such discharge, and glass supporting means for closing off the bottom of the open bottomed receiver during the discharge of the gather.



DEVICE FOR DISCHARGING MOLTEN MATERIAL. U. S. 1,608,603. Nov. 30, 1926. Frank H. Lobb, Millville, N. J., assignor by mesne assignments to Hartford-Empire Co. Filed 3/15/19. In a glass-feeding machine, a glass container having a discharge outlet, a shearing device for periodically severing the discharged glass, a cam mechanically connected to operate said shearing device, and means for adjusting the cam while the machine is operating, to change the time during which said shearing device is away from its position directly beneath the outlet, and thereby to change the dimensions of the charges severed.

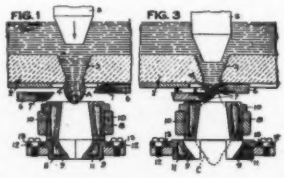
METHOD OF AND APPARATUS FOR FORMING SHEET GLASS. U. S. 1,608,644. Nov. 30, 1926. Harold M. Black, Butler, Pa., assignor to Hartford-Empire Co. Filed 3/1/26. The method of forming sheet glass, which comprises depositing a stream of molten glass upon a moving table having a convex surface.

REGENERATIVE GLASS FURNACE. U. S. 1,608,150. Nov. 23, 1926. William Westbury, Caney, Kans., assignor to Laura Anna Westbury, Independence, Kans. Filed 12/27/22. One object is to provide means for controlling communication between a burner flue and the stack and the source of air supply, whereby individual control for each burner flue is ensured, whereby uniformity of operation of the burners may be secured, and whereby chilling of the glass due to variations in the volume of gas supplied and spasmodic currents of air may be obviated and the noted objections to furnaces of ordinary construction overcome or reduced to the minimum.



GLASS CONTAINING GERMANIUM. U. S. 1,607,817. Nov. 23, 1926. Louis M. Dennis, Ithaca, N. Y. Filed 1/14/25. The method of producing transparent germanium containing glass, which comprises heating together a mixture of a germanium compound, acting as an acid constituent of the glass, with a compound of a basic element which will react therewith to form a homogeneous transparent fluid.

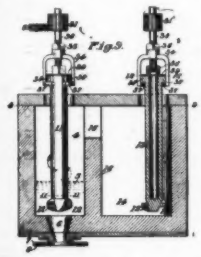
APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,608,601. Nov. 30, 1926. John R. Keller, Carnegie, Pa., assignor by mesne assignments to Hartford-Empire Co. Filed 5/13/21. Relates to the shaping of the gather or gob after it issues from the discharge orifice, by the use of a shaping member which is interposed below the suspended gather, and also below the shears. This shaping receptacle consists of a cup having a continuously open bottom and formed in sections which are periodically moved to catch the descending gather and retard its fall, and



thereafter to release the gather and permit it to drop into the mold. This retarding and shaping receptacle never completely checks the flow of the gather.

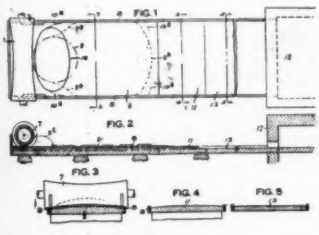
GLASS-BLOWING MACHINE. U. S. 1,607,607. Nov. 23, 1926. N. Cramer, Toledo, O., assignor to The Owens Bottle Co. Filed 5/11/23. The combination with a mold, of means to support a bare blank of glass in position to be enclosed in the mold, and means for centering the blank in said position comprising, in combination, a centering arm, fingers carried thereby, automatic means to move said arm to operative position in relation to the blank where the latter is supported by said supporting means, and means to effect a relative movement of said fingers into and out of operative position.

GLASS-FEEDING APPARATUS. U. S. 1,608,710. Nov. 30, 1926. James Morrison, San Francisco, Cal. Filed 10/14/22. A principal object resides in means for automatically agitating and moving a mass of molten material whereby a uniform temperature and consistency is maintained during the period of time it is necessary to manipulate it in the process of manufacturing articles therefrom. Also means for modifying the agitating means in a special way to suit varying conditions of manufacture. Also manipulative control for removing and changing the agitating elements without in any manner dismantling or disarranging the machine proper. Fig. 9 shows two of the agitating elements in their respective operative positions, one element in the boot with its lower end immersed in a body of molten material and the other element in the warming chamber adjacent thereto.



GLASS-FORMING MACHINE. U. S. 1,607,643. Nov. 23, 1926. Harold A. Rohrich, Toledo, O., assignor to The Owens Bottle Co. Filed 2/24/26. In a glass-forming machine, means for chilling corresponding sides of a plurality of suspended charges of molten glass in plastic form, said means including an elongated body having a set of longitudinally spaced slot-like orifices along one wall.

METHOD OF AND APPARATUS FOR FORMING SHEET GLASS. U. S. 1,608,656. Nov. 30, 1926. George E. Howard, Butler, Pa., assignor to Hartford-Empire Co. Filed 2/17/26. One object is to provide a means whereby glass may be poured out of a pot onto a table and quickly spread into a mass with little or no lateral movement of the pot along the roll, the glass assuming an elliptical contour without use of hooks, scoops or pot travel. The method comprises depositing a mass of molten glass upon an elongated table having a convex surface, and passing a concave roller over the glass so deposited. A flattening table at one end of the first-named table having a surface which tapers from a convexity corresponding to that of the first-named table to a plane is provided.



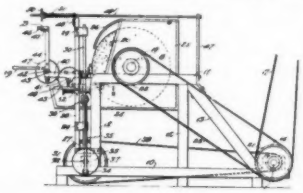
METHOD OF AND APPARATUS FOR FORMING SHEET GLASS. U. S. 1,608,657. Nov. 30, 1926. George E. Howard, Butler, Pa., assignor to Hartford-Empire Co. Filed 3/13/26. The step in the process of forming sheet glass which comprises depositing a mass of molten glass upon the lower portion of an inclined surface, and then tilting the surface to reverse the direction of incline and thereby cause the glass to flow toward the opposite end.

DECORATED GLASSWARE AND PROCESS OF MAKING SAME. U. S. 1,608,670. Nov. 30, 1926. Harper J. Ransburg, Indianapolis, Ind. Filed 6/4/26. The process of decorating a base form, consisting in treating the surface of said glassware with benzol, applying thereto a composition of lithopone, zinc oxide, whiting, superspectra black, lamp black and incorporating oils, decoratively forming the surface of said composition while in a plastic state, mounting jewels therein, and thereafter decorating said surface upon said composition becoming hardened.

BOTTLE-RACK-ACTUATING DEVICE FOR BOTTLE-POLISHING MACHINES. U. S. 1,609,035. Nov. 30, 1926. Clarence R. Nixon, Baltimore, Md., assignor to Swindell Brothers. Filed 2/12/25. In a device of the kind described, a polishing drum, rack supporting rails extending from points adjacent the drum, a bottle rack slidably mounted on said rails, a rack tilting device fixed in the path of said rack adjacent the drum, an oscillating frame supporting said rails, and means to oscillate said frame.

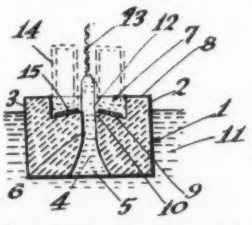
BOTTLE-RACK-ACTUATING DEVICE FOR BOTTLE-POLISHING MACHINES. U. S. 1,609,036. Nov. 30, 1926. Clarence R. Nixon, Baltimore, Md., assignor to Swindell Brothers. Filed 2/12/25. In a device of the kind described, a polishing drum, a bottle rack movable rectilinearly toward and from the drum, means connected to the rack for imparting said movement thereto, and a rack tilting device interposed in the path of said rack, said rack being tiltable between horizontal and vertical positions.

BOTTLE-POLISHING MACHINE. U. S. 1,608,857. Nov. 30, 1926. C. R. Nixon, W. B. Swindell, Jr., and John L. Dunnock, Baltimore, Md., assignors to W. R. Swindell, C. J. B. Swindell, W. B. Swindell, Jr., W. E. Swindell and H. O. Browner. Filed 5/23/26. A bottle-polishing machine, including a main frame, a polishing drum rotatably supported on said frame, guide bars pivoted to said main frame to swing toward and from the drum, a bottle holding frame reciprocably mounted on said guide bars, means to rotate the drum and reciprocate the bottle holding frame simultaneously, spring means urging said guide bars toward said drum, and limit stops having screw connections with the guide bars and bearing against the main frame to form adjustable limit stops for the movement of said guide bars toward the drum.

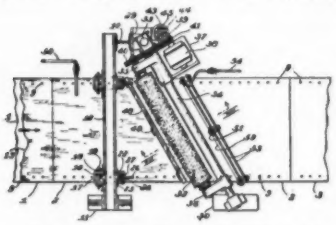


GLASS FURNACE. U. S. 1,605,885. Nov. 2, 1926. Paul G. Willetts, Berlin, Conn., assignor to Hartford-Empire Company. Filed 6/24/26. It has not been possible with safety to line glass melting furnaces with blocks of high-grade refractory material and to surround the side walls and bottom with insulating layers or with layers of ordinary refractory material to add to the strength of the walls and to reduce the dissipation of heat through them because the refractories that have been at all suitable for contact with the glass have been lighter than the molten glass and, therefore, able to float in the glass. It has been the customary practice to build the bottoms of glass furnaces, and the side walls at the melting ends of the furnaces, of single layers of blocks, so that the glass entering between the blocks will freeze before the glass can penetrate behind the blocks and float them out of place. This invention provides the bottom and side walls of a glass melting furnace with glass-engaging surfaces composed of refractory blocks of high grade and of such specific gravity that they are heavier than the molten glass which is to come into contact with the blocks so that the glass will not be able to dislodge the blocks by causing them to float.

METHOD AND APPARATUS FOR TREATING SHEET GLASS. U. S. 1,609,266. Nov. 30, 1926. Harold C. Metzgar, Torrance, Cal., assignor of one-half to Joseph Berman, Torrance, Cal. Filed 12/23/25. An object is to eliminate the waves or streaks or other irregularities in the surface of glass drawn by the Fourcault process by reducing the conduction or radiation of heat from the refractory material adjacent which the glass is drawn. A further object is to apply a covering or coating of heat insulating material on the refractory body or to incorporate a heat insulating composition therein. This invention also comprehends the apparatus in the form of refractory bodies against or adjacent which the molten glass is drawn, having a heat insulating or retarding medium incorporated therein or covering part or all of the refractory bodies.



APPARATUS FOR CLEANING PLATE-GLASS-GRINDING TABLES OR CARS. U. S. 1,610,374. Dec. 14, 1926. Herman S. Heichert and Albert E. Evans, Pittsburgh, Pa., assignors to Pittsburgh Plate Glass Co. Filed 3/18/25. Apparatus for cleaning plaster from tables mounted for movement along a track, comprising a rotary brush extending across the track and provided with radially extending metallic fibers, an adjustable tilting frame carrying the brush and power means for rotating the brush at a high rate of speed so as to cut the plaster from the tables as they pass beneath the brush, said power means being supported from said frame.



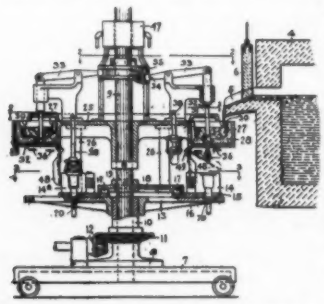
DRAWING FLAT SHEET GLASS. U. S. 1,610,004. Dec. 17, 1926. Lawrence A. Grolemund, Charleston, W. Va., assignor to the Libbey-Owens Sheet Glass Co. Filed 9/27/23. Apparatus for regulating the temperature of individual transverse portions of drawn sheets at an intermediate stage of the sheet formation.

A cooler positioned transversely of the glass sheet, and comprising a longitudinally arranged series of separate chambers, individual inlet and outlet pipes leading to each chamber, and means accessible from outside the machine for controlling the flow of cooling fluid to each chamber.

GLASS MOLD. U. S. 1,609,707. Dec. 7, 1926. Bernard C. Gilligan, Toledo, O. Filed 7/17/24. A glass mold comprising a plurality of sections each including a metal shell and a composition lining on the inner face of the shell, a layer of cement between the lining and shell, retaining means secured to the edges of the shell and engaging the lining, and a plurality of screws extending through the shell and into contact with the lining to hold the latter in close engagement with said retaining means.

METHOD OF MAKING GLASS MOLDS. U. S. 1,609,708. Dec. 7, 1926. Bernard C. Gilligan, St. Marys, W. Va. Filed 7/17/24. A method of constructing molds for glass articles comprising affixing a composition lining to the inner surface of a metal shell, and then shaping the lining to conform to the contour of the article to be molded.

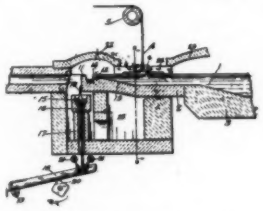
METHOD OF AND APPARATUS FOR FORMING GLASS ARTICLES. U. S. 1,610,883. Dec. 14, 1926. Daniel A. Ripley, Pittsburgh, Pa. Filed 10/16/24. Apparatus for forming glass articles, comprising a receptacle rotatable in a horizontal plane, a plurality of molds rotatable in a plane beneath said first plane and co-axially with the rotatable receptacle, and means for delivering mold charges from said receptacle to said molds, the receptacle rotating only in the same direction as the molds.



DRAWING SHEET GLASS. U. S. 1,609,998. Dec. 7, 1926. Enoch T. Ferngren, Toledo, O., assignor to the Libbey-Owens Sheet Glass Co. Filed 8/6/23. The method of preventing loss of heat from the side portions of a relatively shallow body of glass in a container from which a sheet is drawn, which consists in so disposing the container and the body of glass therein that heat may be applied externally thereto, in causing the greater proportion of said heat to be applied in the regions along and adjacent the end and side portions of the container, and in utilizing said heat in a reverberatory fashion along the upper surface areas and side portions of the body of glass in the container.

APPARATUS FOR MAKING PLATE GLASS. U. S. 1,610,367. Dec. 14, 1926. Frederick Gelstharp, Tarentum, Pa., assignor to Pittsburgh Plate Glass Co. Filed 5/8/25. In combination, a glass tank containing a body of molten glass, an outlet member seated in the glass from above, and having a vertical outlet slot therethrough, a pair of driven and cooled sizing rolls above the slot extending longitudinally of the slot at the outlet end thereof adapted to receive the glass and size it, and a glass receiving bed extending laterally from the side of one of said rolls for carrying away the glass which is formed.

DRAWING SHEET GLASS. U. S. 1,609,999 Dec. 7, 1926. Enoch T. Ferngren, Toledo, O. Assignor to the Libbey-Owens Sheet Glass Co. Filed 9/10/23. One object is to facilitate the flow of molten glass to the sheet source, to prevent the stagnation and devitrification of portions of this molten stream adjacent the sheet source, and to simultaneously convert a portion of the molten stream into cullet, which subsequently may be used in the production of molten glass.



GLASS COMPOSITION. U. S. 1,609,329. Dec. 7, 1926. William Chittenden Taylor, Corning, N. Y., assignor to Corning Glass Works. Filed 10/10/23. Boric oxide when used in quantities necessary to replace silica when glasses free from silica are desired tends to reduce the stability of glasses to chemical attack and to cause devitrification.

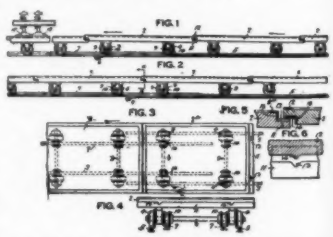
This invention has for its object to provide an improved silica free glass, or glass practically free from silica, having a good stability for such a glass, and having but little tendency to devitrification. The following are examples of compositions of glasses falling within the invention:

	I	II	III	IV	V	VI
B_2O_3	67	65	60	55	50	65
Al_2O_3	15	20	15	20	30	18
CaO	15	5	20	20	10	10
K_2O	3	10	5	5	10	4
Na_2O	..	..	..	..	..	3

It will be noted that none of the above preferred compositions contain over 10% of alkali (which would seriously impair stability); that calcium oxide is used as the oxide of the second periodic system to the exclusion of magnesia (which tends to devitrification), although magnesia and zinc oxide may replace some of the lime; that the alkali in most of them is in the form of potash, instead of soda; and that relatively large quantities of alumina are present.

In melting such a glass, care must be taken that no large quantity of silica is absorbed in the melting. This can be avoided in practice by using a tank constructed of block of carefully selected material, melting the glass at as low a temperature as possible, and keeping the tank walls as cool as possible. With proper precaution the melted glass will contain less than one per cent silica, and even as low as one-tenth of one per cent.

GRINDING AND POLISHING TABLE. U. S. 1,610,184. Dec. 7, 1926. Frank E. Troutman and Charles H. Christie, Butler, Pa. Filed 10/3/23. Apparatus for grinding or polishing flat glass comprising a plurality of relatively movable associated tables, a projection on one of said tables, and a horizontally disposed engaging surface on an adjacent portion of another table, the riding support for said tables being arranged to bring said projection to rest upon said engaging surface, to maintain the surfaces of said tables in horizontal alignment.



Glass Factory Equipment and Supplies

Most of the information printed in this department comes direct from the manufacturers of the products described.

Measuring the Degree of Diffusion of Opaque and Frosted Glasses

Simple Apparatus Developed by German Instrument Makers

The extensive use of opaque and translucent glasses and of frosted electric light bulbs in the lighting industry makes it desirable to have a means of measuring the degree of diffusion of various glasses. The ideal lamp shade should cause an amount of diffusion of light as to render the shade itself luminescent without an appreciable loss of light intensity, either through reflection or absorption. The illuminating industry endeavors to

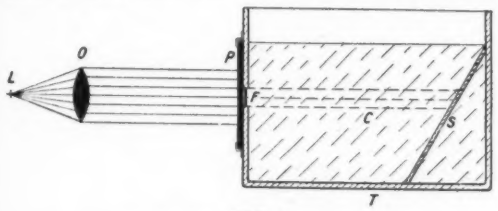


FIG. 1

approach these ideal conditions. It is a problem of the glass industry to create a glass that combines a large degree of diffusion with the smallest possible loss of light intensity. A comparison of the opaque glasses now at the disposal of the illuminating engineer with the product of twenty years ago is sufficient answer as to whether the glass industry is making progress in this line.

The requirements of an apparatus for the testing of illuminating glassware are twofold: the degree of diffusion must be measured with some accuracy, and also the degree of translucency.

It is not practicable to solve the problems of light diffusion in a mathematical way. The laws of the diffusion of light are only known in a qualitative manner, and no formula has as yet been developed which would give hope of solving this problem.

The various degrees of diffusion caused by different glasses can be demonstrated by means of a simple apparatus.[1] (Fig. 1.)

[1]Dr. Hans Schulz, Fourth Meeting of the German Society of Glass Technology, Nov. 26 and 27, 1925. Berlin. *Glastechnische Berichte*, Vol. IV, 81-92.

The light rays from a source L are made parallel (Fig. 2) by means of a lens O and pass through an opening F, covered by window glass, into a container T, filled with a colloidal solution of thorium oxide. The light is projected on a piece of frosted glass S. The rays are clearly visible in the colloidal solution.

If a piece of frosted glass is held before the opening F, the light becomes less strong and is diffused in the shape of a cone. (Fig. 3.) On account of the stronger deflection of the light rays of short wave lengths the light becomes red.

If an opaque glass, which permits some light to pass without diffusion, is tested, the picture will show a cone of diffused light and also the direct rays. (Fig. 4.) Opaque glass which does not allow any direct light rays to pass shows only a cone of diffused light. (Fig. 5.)

The degree of light intensity of the cone and that of the direct rays passing through the glass, offer a means of classification of opaque and frosted glasses. To make finer distinctions a red glass is used, which decreases the light intensity of the diffusion cone. The following classification is made:

CLASSIFICATION OF OPAQUE GLASSES

1. Strong, direct light; diffusion cone invisible.
2. Diffusion cone just visible. Invisible when observed through red glass.
3. Diffusion cone visible through red glass. Direct light still quite strong.
4. Direct light medium strong.
5. Direct light weak.
6. No direct light visible.

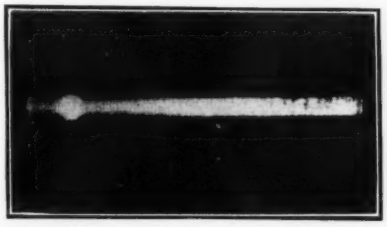


FIG. 2

FIG. 3

FIG. 4

FIG. 5

CLASSIFICATION OF FROSTED GLASSES

1. The light is only silghtly diffused. No cone visible.
2. Light is more diffused, cone only visible without red glass.
3. Cone barely visible through red glass.
4. Cone sharply outlined. The direct light is so strongly diffused that the outlines are barely visible.
5. As above, only more pronounced. Only very little direct light visible.
6. No direct light visible.

The apparatus just described is not suitable for practical work outside of the laboratory. To meet the demand for a simple and effective apparatus for the measurement of the degree of diffusion of opaque and frosted glasses, the firm of Schmidt & Haensch, Berlin, Germany, has constructed an instrument, after the design of Bloch. (Fig. 6.) The glass to be tested is inserted on the right hand side. A series of standard comparison glasses, fixed in a metal holder, which can slide back and forth, enables the

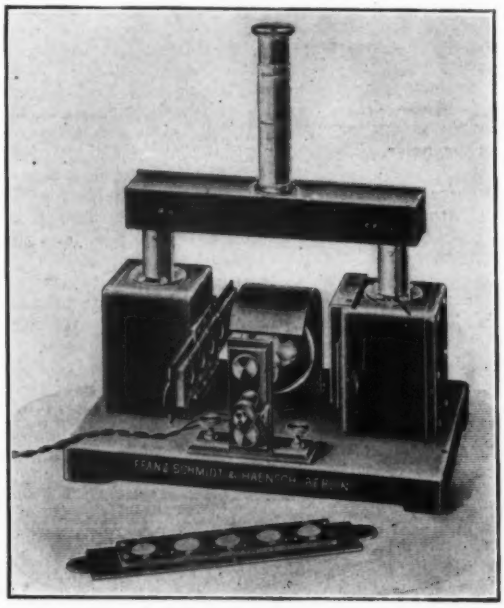


FIG. 6

operator to observe each standard in turn and compare it with the test glass.

The standard and the test glass are illuminated by the same light source. By a combination of prisms the light rays, passing through the standard glass and through the test piece, are brought side by side in the photometer for simultaneous comparison by the observer.

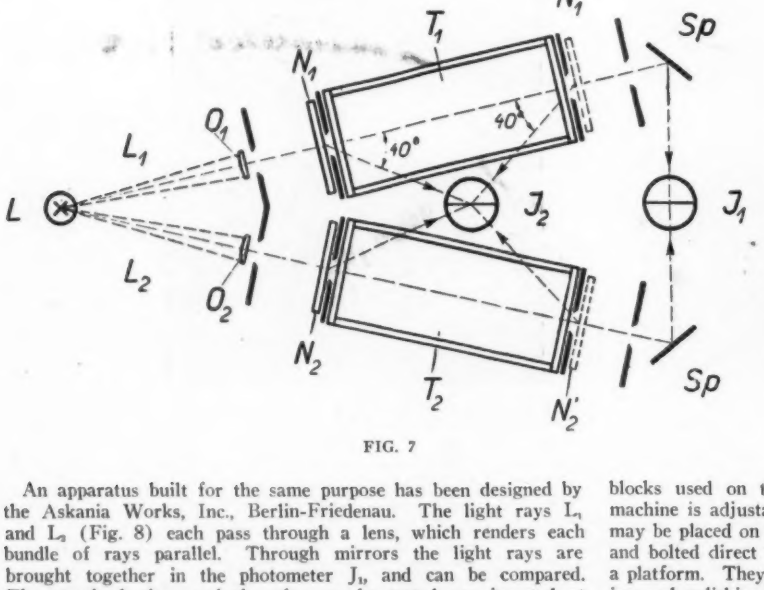


FIG. 7

An apparatus built for the same purpose has been designed by the Askania Works, Inc., Berlin-Friedenau. The light rays L_1 and L_2 (Fig. 8) each pass through a lens, which renders each bundle of rays parallel. Through mirrors the light rays are brought together in the photometer J_1, and can be compared. The standard glass and the glass to be tested are inserted at N_1 and N_2.

Glassworks Activities

The Amsler-Morton Company, Pittsburgh, Pa., reports contracts on hand at the present time for the erection of a new melting tank for the Carr-Lowrey Glass Company, Baltimore, Md., the fourth of its kind in as many years; also, a batch-handling plant. A new continuous tank and one eight-foot lehr is to be installed for Diamond Glass Company, Royersford, Pa.; the 40-ton tank of Maryland Glass Corporation, Baltimore, Md., and one 10-foot lehr are to be completely rebuilt. A second continuous recuperative tank is to be erected for Liberty Works, Egg Harbor, N. J. An additional Amco lehr is to be installed at the Clarksburg plant of the Hazel-Atlas Glass Company; a new continuous tank is being erected for theVidrierra-Monterrey, at Monterrey, Mexico; a new continuous tank and fuel oil system is being installed at Rio Janeiro, Brazil; three continuous lehrs are to be completely remodeled and improved for Nivison-Weiskopf, Reading, Ohio; a small pot furnace and working tanks are being built for Christensen Agate Company, Payne, Ohio; an Amco tableware glazer of the continuous variable speed type with all appurtenances mounted to form a portable unit for a pot furnace plant is being built for Diamond Glassware Company, of Indiana, Pa., where one new recuperative tank and two new lehrs were recently completed; two 10-foot x 80-foot lehrs were recently remodeled for Root Glass Company, Terre Haute, Ind.; a 10-foot x 75-foot was remodeled to "C" type for Glenshaw Glass Company, Glenshaw, Pa.

New Style of Exhaust Fan

A new feature characterizes the Macleod-Keeney exhaust fan, recently put on the market by The Macleod Company, Bogen Street, Cincinnati, O. It differs from the ordinary design in having, instead of a center inlet, a projected inlet adjacent to the discharge outlet, as seen in the illustration.

The material is brought in through the inlet and discharged at right angles, the wheel being protected by a deflector plate. The only duty imposed on the impeller is the creating of suction by centrifugal force, the air passing the inlet causing a high suction. Pressures up to 12 pounds are obtainable. The manufacturers state that it will convey material just as far, produce as strong a suction, and does not require as much horsepower as the types of fans heretofore in general use and that clogging and throwing of the wheel out of balance is avoided and freedom from abrasion by passing materials is obtained, adding to the life of the wheel.

These machines are constructed almost entirely of steel, including the housing, bearing standard and wheel, the ball-bearing pillow

NEW FAN WITH PROJECTED INLET ADJACENT TO DISCHARGE OUTLET

blocks used on the drive shaft. They are reversible and each machine is adjustable to over thirty different combinations. They may be placed on the floor or other suitable foundation or reversed and bolted direct to overhead timbers, saving the cost of building a platform. They are suitable for use in box-making plants, grinding and polishing rooms and wherever any materials that can be conveyed by air are handled, or where smoke, fumes or dust occur.

The Glass World and What It Is Doing

News of the Industry

Detroit Meeting of American Ceramic Society

Glass men who attend the twenty-eighth annual meeting of the American Ceramic Society to be held at the Book-Cadillac Hotel, Detroit, February 14 to 19 inclusive, are promised a most interesting program for the meetings which will take place on Tuesday and Wednesday of that week.

Members of the Division have received a list of ten of the papers to be read and discussed at these meetings, from C. D. Spencer, chairman of the program committee, who with the aid of the other committee men, E. P. Arthur, A. E. Williams, J. T. Littleton and W. S. Williams, has provided, in the papers listed below, a comprehensive basis for a successful meeting.

(1) The Petrographic Microscope as an Instrument for the Glass Technologist. By H. Insley.

(2) The Physical Properties of Glass and Chemical Composition. By Dr. W. E. S. Turner and S. English.

(3) A Glass Factory in the Days of Nebuchadnezzar.—By A. E. Marshall.

(4) The Analysis of Soda-Lime Glass. By G. E. F. Lundell.

(5) The Etching of Glass by mixture containing hydrofluoric acid and fluoride salts. By C. D. Spencer and L. Ott.

(6) A Method for Measuring the Softening Temperature of Glasses. By J. T. Littleton.

(7) American Glass Tank Practice. By F. S. Thompson.

(8) Glass Sands. By E. P. Arthur.

(9) Durox Glass House Refractories. By T. S. Curtis.

(10) A Method for Measuring the Electrical Conductivity of Glass in the Temperature range 100 to 440°C. By C. D. Spencer and G. Reinker.

The committee earnestly requests the assistance of members in building up this program and their individual cooperation toward the success of the Detroit meeting. This request is earnestly seconded by F. C. Flint, Chairman of the Glass Division, who says:

"We are going to have a great meeting in Detroit. We have a good program. It is not long, but the papers on it are selected. The article by Lundell, of the Bureau of Standards and the work of the Standards Committee, will be the last word in chemical analysis of lime-soda glass. Insley, also of the Bureau of Standards, will give us a thorough discussion of the value of the microscope in chasing troubles in the glass house.

"The papers will not be read hurriedly in order to make room for an over-full program. We are going to have discussions led by men familiar with the work covered by each paper.

"Think about the subjects below and come prepared to contribute your share of discussion and criticism. We want all angles of attack, from the extremely theoretical to the most practical."

Reduced Freight Rates on Cut Glass

The Traffic Committee of the American Flint and Lime Glass Manufacturers Association, consisting of M. A. Smith, of the McKee Glass Company, chairman, Ira A. Akins, of the Monongah Glass Company, and B. E. Factor, of the Hocking Glass Company, secretary, have been working for more than a year to obtain a reduction in the freight rate on cut glass. A new rate, effective January 10th, 1927, has been published in Supplement No. 41 to the Consolidated Freight Classification No. 4.

The new rate is "Cut Glassware, N. O. I. B. N., actual value declared in writing by the shipper of the property, in accordance with the following:

"Actual value not exceeding $30.00 per 100 pounds, packed in barrels or boxes, L. C. L. 1st class, Official, Southern and Western.

"Carload, minimum weight 20,000 pounds, 3rd class, Official, Southern and Western."

Shipper must certify on the shipping order and bill of lading the actual value of the cut glass where the actual value does not exceed $30.00 per hundred pounds.

This, Mr. Smith states, is a very fair rate, and is a considerable reduction, as compared to the old cut glass rate, which specified no carload rate whatsoever. There is no question but that this new reduced rate will mean an increase from now on in the sale of cut glass, for the reason that in many instances, to distant points, the amount of freight paid has equaled and exceeded the invoice value of the glass shipped.

It has also been brought out in the work of the committee, that a great many purchasing agents have refused to list and purchase cut glass items, because of the excessive freight rate that has prevailed heretofore and have stated that as soon as the new rate becomes effective, it will be interesting and profitable to list cut glass items.

Drakenfeld Company Acquires New Headquarters

B. F. Drakenfeld & Company, Inc., who have been supplying chemicals to the glass industry for many years, have acquired a five-story building at 45-47 Park Place, New York, which is being rebuilt for the sole occupancy of the corporation. The building occupies a plot 55 x 90 feet and is provided with a basement and subbasement. Removal to the new quarters will take place very shortly.

The new location is not far from the company's present location, and the business has always, since its inception, been located in this immediate section of New York. It was established in 1869 and shortly afterwards located at 21 Park Place. In 1880, the business was moved to 27 Park Place and remained there until the spring of 1913 when it was taken to its present location at 50 Murray street.

The company is the pioneer organization in this country to specialize in colors, chemicals and other supplies for the glass, pottery and enameling industries. The growth of the business has corresponded to the development of these industries in this country. The company now has manufacturing establishments at Chicago, Ill., and Washington, Pa., and maintains branch sales offices at East Liverpool, O., and Chicago. It owns the Wheeling Pulverizing Company and the Mineral Mining and Milling Corporation, with properties respectively at Wheeling, W. Va., and adjacent to Embudo, N. M.

The officers of the corporation are as follows: Mrs. B. F. Drakenfeld, chairman, board of directors; B. F. Drakenfeld, Jr., president; William Hoffman, vice-president; Oscar F. Zeiler, vice-president; and Scott J. Courtney, secretary and treasurer. These with Dr. R. R. Shiverly, the well known chemist, constitute the board of directors.

Exhibits at Power Show

At the recent power show held at the Grand Central Palace, New York, early in December there were among hundreds of exhibits, a number that were of interest to glass manufacturers. The Queens Run Refractories Company, Inc., Lock Haven, Pa., had an interesting showing of "Q R Glass" brick; Buffalo Forge Company, Buffalo, N. Y., blowers and exhaust fans; Pennsylvania Pump & Compressor Company, air compressors, vacuum pumps, etc.; Combustion Service Corporation, Tri-Fuel burner for coal, oil and gas, burning either one individually or all in combination; Armstrong Cork & Insulation Company, Pittsburgh, Nonpareil insulating brick; Bristol Company, Waterbury, Conn., pyrometers and other temperature indicating, recording and regulating instruments; Celite Products Company, Los Angeles, Cal., Sil-O-Cel insulating brick and materials; Brown Instrument Company, Philadelphia, Pa., pyrometers, etc.; R. H. Beaumont Company, Philadelphia, Pa., materials elevating and conveying equipment; Carborundum Company, Perth Amboy, N. J., refractory material; Clarage Fan Company, Kalamazoo, Mich., fans and blowers; Chas. Engelhard, New York, pyrometers; General Refractories Company, Philadelphia, fire brick; A. P. Green Fire Brick Company, St.

Louis, Mo., fire brick; Ingersoll-Rand Company, air compressors and vacuum pumps; Jeffrey Manufacturing Company, Columbus, O., elevating and conveying machinery; Keller Mechanical Engineering Corporation, Brooklyn, N. Y., mold making machinery; King Refractories Company, Buffalo, N. Y., fire brick; Leeds & Northrup Company, Philadelphia, pyrometers; Norton Company, Worcester, Mass., abrasives and refractory materials; Ohio Valley Clay Company, Steubenville, O., fire brick and mullite refractories; Spencer Turbine Company, Hartford, Conn., turbo compressors; Taylor Instrument Companies, Rochester, N. Y., pyrometers, etc.; Worthington Pump & Machinery Company, New York, air compressors, and La Mont Corporation, New York, waste heat economizers.

Annual Report, Libbey-Owens Sheet Glass Company

At the meeting of stockholders of the Libbey-Owens Sheet Glass Company at Toledo on December 8, the directors' report presented by President James C. Blair showed a net profit for the fiscal year ended September 30, 1926 of $3,415,189 after deducting $558,538, for expenses, experiments, patents, etc., and $610,000 for estimated taxes. Assets consisted of cash and securities, accounts receivable and inventories and other assets, $7,294,227; investments in affiliated companies, $3,131,216; land, buildings, gas properties, etc., $9,387,951, patents $776,412; miscellaneous, $38,242; amounting in all to $20,628,050. Cash dividends amounting to $1,269,870 were paid.

Liabilities comprised accounts payable, etc., taxes, bonus, estimated income tax $967,053, reserve for contingencies, etc., $587,268. Capital stock issued, preferred $4,000,000, common $8,999,750, surplus $6,073,978, total $20,628,050. After paying dividends of $2,769,870 and deducting $189,000 for depreciation in patents the surplus account showed an increase over that of the previous year of $456,319.

The Charleston, W. Va., plant was operated to full capacity throughout the year, with the exception of interruptions due to routine furnace repairs.

At the end of the fiscal year ten 6-foot machines at this plant had been converted into the improved 7½-foot type, and three more since September 30. The remaining five machines are being changed as rapidly as possible, greatly increasing the production and marketability of the product.

Fifty acres of land close to the present factory have been acquired to provide for possible future expansion.

The East Toledo plate glass plant during the year earned a substantial profit. Each of the subsidiary companies, United States Sheet & Window Glass Company and Fairfield Sheet Glass Company, had a satisfactory year. An additional unit, one wide machine, was added at the Shreveport plant and the unit in operation at Lancaster was enlarged.

The Belgian company controlling Libbey-Owens licenses in Europe reported a profit for the year ending April 30, 1926 of 14,263,221 francs, and paid two dividends on its preference shares. A plate glass plant of eighteen grinding and polishing machines has been installed and put in operation.

The French company put into operation two new units and both plants are in full production with three tanks and six machines. A plate glass plant is being constructed.

The Swiss plant continues in operation under adverse conditions. The Spanish plant has completed its first year of operation with a profit. The Italian company has one unit in operation and a second nearing completion. A plate glass plant will be built here. The German plant with two tanks and four machines is nearing completion. Plate glass will be made here also. The American-Japan Sheet Glass Company, with three machines, continues in full operation, and reported a profit for its fiscal year of 164,657 yen and paid two dividends on the stock held by the Libbey-Owens Company.

The low tariff party in Canada was again successful in the recent election. Until tariff protection is secured which will enable the Hamilton plant to resume operations profitably, the Canadian company will continue to import glass from the Belgian Libbey-Owens manufacturers.

Over $700,000 was expended on acquiring land and widening the machines at Charleston.

President Blair, addressing the stockholders said that, "None of the foreign-made glass being sold in this country is made by companies using the Libbey-Owens process.

"There has been no apparent material change in the progress of various companies endeavoring to develop a competing window glass process. We know of no reason to doubt the superiority in the flat glass industry of the Libbey-Owens process. Possibly we are more aware than they, how far distant these companies are from success.

"As plate glass manufacturers, we are in our second year. Our progress, so far, has met our expectations. We have ideas for improvement and development of this department, some of which are taking definite form. Expansion will go forward as rapidly as warranted."

Regarding a suit recently brought against the company by German interests, Mr. Blair quoted from a letter received from the Libbey-Owens company's attorney as follows:

"From our study of the Verband contract we are of the opinion, confirmed by our investigations so far as they have progressed, that the Verband never acquired any right to your sheet glass patents and inventions."

Eleven Months' Building Record

The total volume of construction contracts awarded in the 37 States east of the Rocky Mountains during November amounted to $487,012,500, according to F. W. Dodge Corporation. These states include about 91 per cent of the total construction volume of the country. The above figure represented a decline of 6 per cent from October, 1926. However, there was an increase of 3 per cent over November of last year.

Analysis of the November building and engineering record for these states showed the following items of importance: $229,820,900, or 47 per cent of all construction, for residential buildings; $64,781,100, or 13 per cent, for industrial buildings; $59,657,100, or 12 per cent, for commercial buildings; $50,128,400, or 10 per cent, for public works and utilities; $34,571,800, or 7 per cent, for educational buildings; $24,691,100, or 5 per cent, for social and recreational projects; $9,603,900, or 2 per cent, for hospitals and institutions, and $9,329,800, or 2 per cent, for religious and memorial buildings.

During the first eleven months of 1926 there was $5,812,518,900 worth of new construction started in the 37 States east of the Rocky Mountains, which was an increase of 6 per cent over the amount ($5,477,581,100) in the corresponding period of last year.

Feldspar and Its Uses

A 36-page booklet on feldspar recently issued jointly by the allied organizations, Golding Sons' Company, Erwin Feldspar Company and Clinchfield Products Corporation, of Trenton, N. J., and intended for distribution among users of feldspar, is dedicated to the executives, ceramic engineers, chemists and workmen of the industries in which feldspar has a place, and contains a description of the origin and uses of this important product, the development of the feldspar industry, how the material is mined, and shows typical products into the making of which feldspar enters.

The vitally important part played by the chemical laboratories in modern industries, including the feldspar branch, is emphasized. The future development of this industry is predicted as one of steady progress. A map showing the location of the companies' numerous mines and mills in various states and views of several of their plants is included. Copies may be obtained on request to the companies' office at Trenton.

New Companies to Make Mullite Refractories

The Ohio Valley Clay Company, well known manufacturers of tank blocks, are now making mullite refractories at their Steubenville, Ohio, plant, using "Shamva" mullite, which is exclusively controlled and marketed by Henry A. Golwynne & Company, 26 Cortlandt street, New York. It is reported that a new corporation has been chartered under the name of the Ohio Valley Mullite Refractories, Inc. Refractories using this mullite are also being made at Seymour, Conn., by a concern recently organized known as the Mullite Refractories Company.

The Ohio Valley company is specializing at present in mullite fire brick, and samples of their products were on exhibition at the big Power Show recently held in New York.

Refractories Institute's Second Technologic Paper

The second technologic paper published by the American Refractories Institute is entitled "The Load Test For Fire Clay Refractories," by M. C. Booze, whose research work on refractories is well known. The following points have been established:

1. The load test should not be used for determining the suitability of fire brick to meet a variety of service conditions.
2. For selecting brick to support loads in furnace walls and arches, the load test should be run under the temperature and load conditions of actual use.
3. Deformation is not apt to be an important cause for failure of fire brick in a furnace wall, and will occur only when a high temperature is developed at a considerable length of time.

The pamphlet is illustrated by four charts and three photographs. Copies of this paper may be obtained from the office of the secretary of the Institute, Oliver Building, Pittsburgh, Pa., a charge of 25 cents per copy being made to cover the cost of printing.

Distributors Elect New Officers

At the annual convention of the National Glass Distributors Association held at the William Penn Hotel at Pittsburgh early in December, the following new officers were elected: D. H. Startsman, Cincinnati, president; A. D. Dwelle, Buffalo, first vice president; and L. H. Kibbe, Oakland, Cal., second vice president. North Storms, Chicago, was re-elected secretary-treasurer. Addressing the meeting the retiring president W. J. Schoonover emphasized the wisdom of continuing the "hand to mouth" buying policy during 1927. At a dinner given to the visitors by the American Window Glass Company, Prof. F. W. Taussig of Harvard University, dean of the American economists, was the principal speaker. His subject was "The Cancellation of the War Debts." William L. Monro, president and general manager of the American Window Glass Company, was toastmaster.

Solvay Sales Organization Under New Name

The Solvay Process Company have announced that beginning January 1, 1927, a new company known as the Solvay Sales Corporation has acquired the entire business of Wing & Evans, Inc., and has assumed, as principals, all contracts executed by that organization, covering Solvay products. The new company is now the exclusive distributor for the manufacturing company. The entire personnel of Wing & Evans, Inc., has become the operating staff of the Solvay Sales Corporation and all offices and branches of Wing & Evans, Inc., the main office of which is at 40 Rector Street, New York, will be continued as offices and branches of the new company.

Tanks Give Way

The bursting of tanks in a number of glass manufacturing plants throughout the country is, as usual, causing considerable loss and damage. Late in November this trouble occurred at several different factories. Included among them was Tank No. 2 at the Grafton, W. Va., plant of the Hazel-Atlas Glass Company, which necessitated the temporary shut down of one part of the factory. At the United States Glass Company's Factory E. on the South Side, Pittsburgh, Pa., several men met with a narrow escape from injury when a tank containing, it is said, over one hundred tons of molten glass burst. The bursting of Tank No. 1 at the Atlantic Bottle Company's plant at Tarentum, Pa., is also reported to have necessitated a shut down of several weeks.

Tendency Towards Heavier Machinery

When distributing their 1927 calendar to the trade recently, Wm. J. Miller, Inc., Swissvale, Pa., took occasion to call attention to the fact most of the glass-working machines illustrated in it were of heavy construction, several being motor driven. The trade now demands heavier machinery substantially built for continuous operation. Wherever possible Timken bearings are used, bearings being a very important feature in the construction of heavy duty machinery.

Prominent Glass Man Retires

Howard S. Evans, president of the Macbeth-Evans Glass Company, with factories at Charleroi, Pa., Marion and Elwood, Ind., and main office at Pittsburgh, Pa., has sold to his associates in the company his entire holdings of stock and retired from the business.

Plate Glass Production

The monthly report of P. A. Hughes, secretary of the Plate Glass Manufacturers of America, states that the production of polished plate glass in the United States for the month of November, 1926, was 9,705,324 square feet, as compared with a production of 9,889,135 square feet in the same month in 1925. The quantity produced in November, however, was 1,480,389 square feet less than was made in October, 1926. Some of the manufacturers are taking advantage of the falling off in demand, and have closed down for repairs.

Trade Activities

At the **Monongah Glass Company**, Fairmont, W. Va., on December 18, fire occurred in plant No. 3, which did some damage but caused no serious delay in production operations.

The Fort Smith Co-operative Window & Glass Company, Fort Smith, Ark., is reported to be taking bids on a 70 x 120 feet factory building, of reinforced concrete and steel construction.

The South Jersey Glass Company, Inc., Camden, N. J., manufacturers of ornamental glass, is reported to have been organized through the New Jersey Corporation & Guarantee & Trust Company, Camden, N. J., with a capital of $125,000.

The Pittsburgh Plate Glass Company is reported to be making progress with the electrification of their plant No. 5 at Ford City, Pa. Completion of the improvement is expected early in the year.

The Modern Co-Operative Window Glass Company, Salem, W. Va., has purchased the land, buildings, equipment and supplies of the Modern Window Glass Company, at a price of $23,649 of which $4,729 is said to have been paid in cash.

The Obear-Nester Glass Company, St. Louis, Mo., defendant in a suit brought by the Hartford-Empire Company, alleging infringement of glass feeder patents, obtained a postponement of the trial from January 10 to April 4, 1927.

William Franzen & Company, Milwaukee, Wis., is reported to have sold their Northern bottle factory on Lincoln street, to Edward Landsberg, president of the Val Blatz Brewing Company. Officers of the purchasing company were quoted as stating that the purchase was made in the hope that the manufacture of beer will eventually be legalized.

The General Flat Glass Company, it is reported, are remodeling the old Mountain State Glass Company plant at Mannington, W. Va., which it recently acquired and where the Fourcault process will be installed. Over a hundred workmen will be employed and manufacturing operations will begin early this year.

The Eastern Plate & Window Glass Company, Bridgeton, N. J., recently organized and of which W. S. Phillips is president, is now making window glass by hand blown methods, operating four rings and nine shops. This is the only window glass factory in the east. The new company occupies the old Parker Brothers bottle plant which had been in disuse for several years.

At a recent stockholders' meeting of the **Toledo Glass Company,** approval was given to the plan of splitting the company's present $100 par value shares into one hundred shares of $1 value each. This will increase the number of shares from 1,500 to 150,000. J. C. Blair, president of the Libbey-Owens Sheet Glass Company, was re-elected president of the Toledo Glass Company.

A report in a Wall Street journal a short time ago to the effect that the **Canada Glass Products, Ltd.,** of Hull, Quebec, Canada, would start manufacturing plate glass about December 1 has been denied by the president, G. F. Post, who states that while they expect to manufacture plate glass and plate glass products later on they will not do so immediately. The company has a silica plant at East Templeton, Quebec, which recently resumed operations.

The Hazel-Atlas Glass Company, Wheeling, W. Va., announced on December 14 the purchase of the entire stock interest hitherto owned by the Owens Bottle Company,

Toledo, for the sum of $3,688,992. This price included 76,254 shares at $48 per share. This stock will be carried as treasury stock at a par value of $25 per share, the cost price being charged to surplus. The transaction will result in a reduction of the capital on which dividends are computed by $1,921,350.

The National Plate Glass Company, Ottawa, Ill., is one of the subsidiary companies of the General Motors Corporation which recently made arrangements with the Metropolitan Life Insurance Company for a group life policy covering their employes and those of numerous other concerns controlled by them. This is the greatest number of employes ever insured collectively, more than 100,000 employes being covered by policies, each for $1,000, making the total amount over $100,000,000.

The Mound City Glass Company, Lumberport, W. Va., went into bankruptcy on December 6, with liabilities of $178,344 and assets of $15,708. The plant formerly operated at Lumberport, was recently purchased by the bond holders and a new company known as the **Acme Glass Company** was organized to operate it. Because a quantity of raw material and finished ware was not included in the sale of the plant bank proceedings were instituted to enable disposition of the stock. E. P. Boggess, V. L. Hornor, J. H. Knight, P. P. Steptoe and J. M. Guither were named as incorporators of the Acme Glass Company.

The Dominion Glass Company, Montreal, Canada, at their annual meeting elected new directors as follows: F. G. Daniels, Ross H. McMaster, Walter Molson and N. McLeod Yuile. Last year's members of the board were re-elected with the exception of A. H. Grier, Lionel Guest, H. D. Herdt and Sir. William W. Bart. Sir Charles Gordon continues as president. The company's operating profit for the fiscal year ending September 30, 1926, was $661,586, compared with $607,037 in the previous year. Surplus after interest, sinking fund and preferred dividends was $309,586, equivalent to $7.28 a share on 42,500 shares of common stock, against a surplus of $256,037 or $6 a share, on the common stock in the preceding year.

Industrial Publications

Cameron Single-Stage Double Suction Volute Centrifugal Pumps. A 24-page catalog issued by the Ingersoll-Rand Company, 11 Broadway, New York, discussing and giving data on this type of pump.

IXL Continuous-Tooth Herringbone Speed Reducers. Foote Bros. Gear & Machine Company, 215 North Curtis street, Chicago, Ill., gives the advantages of and data on herringbone gears, speed reducers, etc.

Sands and Clays. A 32-page catalog giving information on products furnished by A. L. Curtis, Westmoor Laboratory, Chatteris, England. The list includes fire clays, glass sands, abrasive sands, fire sands, feldspars, pumice, zirconium, etc.

La Mont Waste Heat Steam Generator. La Mont Corporation, 200 Fifth avenue, New York. A 16-page catalog illustrating and describing the La Mont type of steam generator as developed for central power stations, public utilities and industrial power plants. It has been applied in conjunction with producer gas generators and is being developed for use in the glass field.

Amsco Fahralloy Castings. A loose-leaf catalog relating to castings for use in high temperature and corrosive processes, made by the Southern Manganese Steel Company, St. Louis, Mo. The catalog contains a discussion of the mechanical properties of metals at high temperatures, describes the characteristics of the material and the products of this company and states that it is suitable for use in glass-making equipment such as ladles, forming and conveying rolls, furnace and lehr equipment, etc. A pamphlet containing notes on the selection, design and use of castings for high temperature service is also issued by the Southern Manganese Steel Company.

The Manufacture of Tam Opax, "the ultimate opacifier." A 24-page book of attractive design and excellent typography, issued by the Ceramic Materials Department of the Titanium Alloy Manufacturing Company, describing, largely by means of pictures, the various steps in preparing the product for the consumer at the company's plants in Florida and Niagara Falls.

Crude zircon containing about 56 per cent zirconium oxide, 5 to 10 per cent titanic oxide and 29 per cent silica is taken from a deposit, evidently of submarine origin, on a beach on the Florida East Coast, and put through a concentrating process. Refined zircon is obtained by putting the raw material through a process consisting of roasting, extraction, washing drying.

The product thus far has been used almost exclusively in the making of glazes and white enamels, where it has come into widespread use and is displacing tin oxide to a large extent.

In the glass field, zircon is of interest because of its use in refractories and it is believed that a way may be found to utilize its good qualities in glass-making.

The book recently issued contains also several pages of valuable data for ceramic calculations including coefficient of expansion tables. These data were prepared under the direction of the well known ceramist, R. D. Landrum, general manager of the company's ceramic department.

Personals

V. W. Peterson has been appointed president of the Inland Glass Company, Chicago, Ill., to succeed the late C. J. Nolan.

A. Scalise, formerly connected with the Columbia Glass Company, Fairmont, W. Va., is reported to have acquired a bottle manufacturing plant at Jacksonville, Fla.

Carl Wills, formerly connected with the United States Glass Company, Pittsburgh, as mold maker, has become connected with the Kopp Glass, Inc., Swissvale, Pa., in the same capacity.

G. Wesley Evans, assistant superintendent for some time past of the Hazel-Atlas Glass Company's Fetterman plant at Grafton, W. Va., has been appointed, it is reported, to take charge of that plant on January 1 as superintendent.

John H. Phillips, who has been head of the bulb inspection department of the Corning Glass Works, Corning, N. Y., has been appointed manager of the company's Wellsboro, Pa., branch. Mr. Phillips' successor in the bulb department at Corning will be B. S. Moxley.

Government Publications

A COLEMANITE DEPOSIT NEAR SHOSHONE, CAL. United States Geological Survey Bulletin 785-D.

UNITED STATES GOVERNMENT MASTER SPECIFICATIONS FOR BRICK, FIRE CLAY. No. 268 A, revised August 7, 1926.

BUREAU OF STANDARDS—ANNUAL REPORT OF THE DIRECTOR for the fiscal year ended June 30, 1926. 48 pages. For sale by the Superintendent of Documents, Washington, D. C. at 5 cents per copy.

BUREAU OF STANDARDS CIRCULAR No. 297. United States Government Master Specification for Refractories, Fire Clay, Plastic, No. 335a; and Circular No. 298, United States Government Master Specification for Fire Clay, No. 334a, in effect for all departments and independent establishments of the government not later than November 8, 1926.

PUBLIC HEALTH BULLETIN No. 162, issued by the United States Public Health Service, Treasury Department, Washington, D. C. 170 page bulletin of a health study of 10,000 male industrial workers and statistical analysis of service in ten industries. For sale by the Superintendent of Documents, Government Printing Office, Washington, at 30 cents per copy.

COMMERCIAL AND INDUSTRIAL ORGANIZATIONS OF THE UNITED STATES, Series No. 5. Prepared by the Bureau of Foreign and Domestic Commerce. This directory, which is said to be the most complete list available of trade associations and commercial organizations, has been recently revised. Copies bound in cloth may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 60 cents each.

Theodore F. Harnack

Theodore F. Harnack died of heart failure at his home 127 North Linden Avenue, Pittsburgh, Pa., at 2:20 P. M. Monday, December 27th. He was born and raised in Pittsburgh. Mr. Harnack has been widely known throughout the glass manufacturing trade of the United States, having been associated with the H. L. Dixon Company for a period of twenty-one years as sales manager and as a director of that company. His duties in that capacity required him to travel extensively and through his association with glass manufacturers and his knowledge of glassmaking, he became intimately acquainted with not only the proprietors but the managers of glass factories in all lines of glass making throughout the country. Mr. Harnack's career and association with the glass business began about 1879 when he first went to work for the old Muzzy and Company, located at Try street and Second avenue, Pittsburgh. This company afterwards merged with George A. Macbeth and the plant was moved to Tenth and Carson streets, known as the old "White House," formerly occupied and operated by Atterbury and Company. The firm then became George A. Macbeth Company and Mr. Harnack was employed first as shipping clerk and afterwards for a period of years traveled as a sales agent for the Macbeth Company during that period of their success when they were manufacturing the celebrated Pearl-top lamp chimneys. About 1891 the Macbeth Company built their factory at Ellwood, Ind. and Mr. Harnack was placed in charge of that plant as superintendent. In 1902 he associated himself with Christ Rott and both of them left the Macbeth Company to establish the General Glass Company in Brooklyn, N. Y. This venture was not a success through no fault of Mr. Harnack and he left there in 1904, taking a position as salesman with the Phoenix Clay Pot Company where he was instrumental in placing their clay products in the market. In 1906 he went with the H. L. Dixon Company and traveled extensively promoting the products of that company and afterwards became interested in the company and was elected a director. Mr. Harnack was a member of Washington Lodge No. 253 F. & A. M. of Pittsburgh, Royal Arch Chapter No. 109 of Ellwood, Ind. and by affiliation member of Pittsburgh Commandery No. 1 Knights Templar; a member of Syria Temple A. A. O. N. M. S. Pittsburgh; Pittsburgh Lodge No. 2 I. O. O. F. and Past Exalted Ruler of Lodge No. 368 B. P. O. E. of Ellwood, Ind. and many other organizations.

He leaves his widow, Mrs. Fanny Taylor Harnack; four sons Charles, William and Ralph of Pittsburgh, and Taylor M. Harnack of Canton, Ohio; six daughters, Mrs. Albert L. Davies, Mrs. F. Carl Brine, Mrs. Lee C. Dunkin, and the Misses Theodora, Edith and Betty Harnack at home; a brother, Albert J. Harnack and a sister, Mrs. Harry Raring and four grandchildren.

Mr. Harnack will be sorely missed by his business associates as well as his friends throughout the country. During his business career he has witnessed the great advancement of the glass industry from the primitive methods of the '70s' to the intensive machine mass production of the present day.

Coming Meetings

THE AMERICAN CERAMIC SOCIETY'S annual meeting will be held at the Book-Cadillac Hotel, Detroit, Mich., during the week February 14, 1927.

The Annual PITTSBURGH GLASS AND POTTERY EXHIBIT will be held at the William Penn and Fort Pitt Hotels, Jan. 10-27.

The national exhibition and convention of the ARTISTIC LIGHTING EQUIPMENT ASSOCIATION will be held at Cleveland, O., with headquarters at the Hollenden Hotel, January 31 to February 5, 1927.

Inquiries Received

For Further Information Address THE GLASS INDUSTRY

347. Can you tell us anything about a liquid transparent cement called "Steetina" that is used in making non-shatterable glass?

348. Can you give us the names of manufacturers producing window glass which permits the passage of ultraviolet rays?

349. Can you furnish us with the names of firms in this country manufacturing glass tanks used for acid and pickling in conjunction with a process in the manufacture of iron and steel, size approximately 20 feet by 4 feet. (Dec. 10.)

What the World Wants

Specific Inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

New Zealand: 23317, window glass, 21-ounce and semiplate.
Turkey: 23394, glassware.

Glass Stock Quotations

PITTSBURGH STOCK EXCHANGE, Dec. 23, 1926
Reported by Moore, Leonard & Lynch, Union Trust Building, Pittsburgh, Pa.

	Bid	Asked	Last
American Window Glass Machine, com.	..	55½	57
American Window Glass Machine, pfd.	..	..	81
American Window Glass, pfd.	..	..	109
United States Glass	15⅜	16	15½
Pittsburgh Plate Glass, com.	..	..	272
Standard Plate Glass, com.	..	..	4
Standard Plate Glass:			
Preferred cumulative	23	27	25
Prior preferred	..	..	75

TOLEDO STOCK EXCHANGE
December 22, 1926.

	Bid	Asked	Last
Owens Bottle Machine, com.	114	...	116
Libbey-Owens Sheet Glass, com.	131	132	131
Libbey-Owens Sheet Glass, pfd.	114	...	116

WHEELING STOCK EXCHANGE
December 22, 1926.

	Bid	Asked	Last
Hazel-Atlas	...	...	51½
Imperial	...	...	72
Fostoria	...	...	150
Central	...	...	75

READERS WANTS AND OFFERS

Glassmaker

WANTED:—Glass maker with practical knowledge of glass making in machine window glass factories, and experienced in use of producer gas. Must have been actually employed as glass maker or head teaser for past five years in some successful glass factory, and capable of directing the operation of two or more tanks.

Steady employment, no lay-offs and an excellent opening for the right man.

When replying state age, experience and where employed for past five years.

Address Box G, care Glass Industry, 50 Church St., New York, N. Y.

Glass Factory Manager

WANTED: Position as manager in glass factory by man now employed but desires change to position offering good future. Sixteen years as executive in automatic factory. Married, age 40. Address, MANAGER, care GLASS INDUSTRY, 50 Church Street, New York.

China and Glass Decorator

WANTED:—Position as china and glass painter specializing in decorating pharmaceutical bottles, shields of different kinds, china and enamel, hotel and other ware. Desires permanent eventually (leading) position. Address DECORATOR, care GLASS INDUSTRY, 50 Church Street, New York.

Claret Bottles Wanted

In the market for claret type bottles, dark glass, of capacity between 16 and 21 ounces. Advise quantity available and price, otherwise, if you have molds. Virginia Dare Extract Co., Inc., Bush Terminal Building, No. 10, Brooklyn, N. Y.

Current Prices of Glass-Making Materials

December 23, 1926

Quotations furnished by various producers, manufacturers and dealers.

		Carlots	Less Carlots
Acid:			
Citric	lb.	.44½	.44½
Hydrochloric (HCl) 20° tanks, per 100 lb.		.95-1.05	..
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13
52% and 48%	lb.	..	.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.00-16.00	..
Tartaric	lb.	.29½	.29½
Alcohol, denatured	gal.	..	.40
Aluminum hydrate (Al $(OH)_3$)	lb.	.05	.05½
Aluminum oxide (Al_2O_3)	lb.	..	.05
Ammonium bifluoride (NH_4) FHF	lb.	..	.21-.22
Ammonia water (NH_4OH) 26° drums	lb.	..	.03½
Antimony, metallic (Sb)	lb.	..	.14
Antimony oxide (Sb_2O_3)	lb.	..	.16½
Antimony sulphide (Sb_2S_3)	lb.	.15	.16½
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.03½	.04
Barium carbonate ($BaCO_3$)			
Precipitated	ton	49.00-55.00	51.00-58.00
Natural, powdered, imported	ton	42.00-44.00	45.00-46.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	..
Barium nitrate ($Ba(NO_3)_2$)	lb.	.07½	.08
Barium selenite ($BaSeO_3$)	lb.	..	..
Bone ash	lb.	.05	.05½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.04	.04¾-.04¾
Boric acid (H_3BO_3)	lb.	.08	.08½-.09¼
Refined	lb.	.08-.09½	.08½-.10¾
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.05-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	.28	.29
Cobalt oxide (Co_3O_4)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.25-.30
Black prepared	lb.	.	.30
Cryolite ($Na_3Al F_6$) Natural Greenland			
Kryolith	lb.	..	.09¼-.09½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		1.20	1.35
Feldspar—			
100 mesh	ton	11.00-20.00	16.00-22.00
80 mesh	ton	13.50	..
40 mesh	ton	..	..
Fluorspar (CaF_2)—			
Powdered white, 95%	ton	40.00	40.00
" " 90%	ton	38.00	..
Formaldehyde	lb.	.11¼	.11½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.02-.03
Black (FeO)	lb.	..	..
Kaolin (f.o.b. mine)	ton	10.00	..
English, lump, f.o.b. New York	ton	13.00-23.00	..
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb.	..	..
Lead oxide (Pb_3O_4) (red lead)	lb.	..	.11¼
Litharge (PbO)	lb.	..	.10¾
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls.	Per bbl.	2.15	2.30
Limestone ($CaCO_3$)		2.00	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.04	.04½
light (in bbls.)	lb.	.22	.24
extra light (in bbls.)	lb.	..	.37
Magnesium carbonate ($MgCO_3$)	lb.	.06¼	.06¼-.07
Manganese 85% (MnO_2)	lb.	.04½	.05
Nickel oxide (Ni_2O_3), black— for nickel content	lb.	..	.35
Nickel monoxide (NiO), green— for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	..	19.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.08	.08¼
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.06¾
Hydrated 80-85%	lb.	.05¾	.06
Potassium chromate (K_2CrO_4)	lb.	..	.27
Potassium hydrate (KOH) (caustic potash)	lb.	.07½	.07¾
Potassium nitrate (KNO_3) (gran.)	lb.	.05¾-.06	.06½-.06¼
Potassium permanganate ($KMnO_4$)	lb.	.14	.14¼
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.29
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	20.00-22.00	25.00-35.00
Selenium (Se)	lb.	..	2.10-2.15
Silver nitrate ($AgNO_3$)	oz.	..	.39¾
Soda ash (Na_2CO_3) dense, 58%—			
Bulk	Flat per 100 lb.	1.35-1.40	..
Bulk, on contract	Flat per 100 lb.	1.27½-1.35	..
In barrels	Per 100 lb.	1.57½-1.69	2.40
In bags	Per 100 lb.	1.37½-1.45	..
Spot orders .05 per 100 lbs higher			
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.06¼	.06¾
Sodium hydrate (NaOH) (caustic soda)	Per 100 lb.	..	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03¾	.04¼
95 per cent.	Per 100 lb.	2.60	2.80
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.05	.05½
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.10-1.30
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy, in bbls.	Per 100 lb.	2.85	3.20-3.40
Tin chloride ($SnCl_2$)) (crystals)	lb.	..	.47
Tin oxide (SnO_2) in bbls.	lb.	..	.72
Uranium oxide (UO_2) (black, 96% U_3O_8) 100 lb. lots	lb.	..	1.30-2.25
Zinc oxide (ZnO)	lb	.07	.07¼

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to November 24, 1926

	October 1925 Quantity	October 1925 Value	October 1926 Quantity	October 1926 Value	Ten Months Ending October 1925 Quantity	Ten Months Ending October 1925 Value	Ten Months Ending October 1926 Quantity	Ten Months Ending October 1926 Value
Glass and glass products (total)	.....	$728,254	.....	$885,906	.....	$7,025,457	.....	$7,612,858
Plate and window glass—								
Window glass, common, box 50 sq. ft.	1,312	10,141	1,881	12,922	21,532	125,173	26,141	154,493
Plate glass, unsilvered, sq. ft.	135,253	25,764	27,034	9,953	1,182,634	321,798	837,666	222,152
Other window and plate glass lbs.	358,030	30,405	195,848	15,528	2,109,015	235,746	1,845,839	192,922
Glass containers (bottles, vials and jars)	.....	200,364	.....	381,093	.....	2,424,137	.....	2,655,058
Table glassware, plain	.....	160,711	.....	155,578	.....	1,458,677	.....	1,376,336
Table and other glassware, cut or engraved	.....	20,204	.....	14,812	.....	131,800	.....	147,315
Lamp chimneys and lantern globes lbs.	137,786	30,355	111,673	25,000	1,576,831	291,516	1,746,526	330,460
Globes and shades for lighting fixtures lbs.	197,285	50,136	165,653	60,170	1,360,113	410,232	1,467,305	490,686
Chemical glassware lbs.	22,311	21,369	20,547	16,805	190,922	161,277	184,654	167,648
Electrical glassware, except for lighting lbs.	186,040	29,416	115,561	22,496	2,431,692	239,258	4,285,939	395,178
Other glassware	.....	149,389	.....	171,549	.....	1,225,843	.....	1,480,610

IMPORTS

Corrected to November 24, 1926

Glass and glass products (total)	.....	1,521,674	.....	2,050,962	.....	14,605,497	.....	17,562,803
Cylinder, crown and sheet—								
Unpolished dut. lbs.	3,867,195	176,284	5,992,448	234,412	39,248,524	2,050,646	66,582,849	2,660,928
Bent, ground, beveled, colored, painted, etc., and polished dut.	.....	26,638	.....	49,207	.....	447,079	.....	463,124
Plate glass dut. sq. ft.	1,248,619	410,427	2,203,051	782,434	14,386,960	6,349,801	22,579,408	7,463,756
Containers—bottles, vials, etc dut.	.....	14,881	.....	21,203	.....	147,363	.....	228,770
Table and kitchen utensils dut.	.....	25,733	.....	15,309	.....	116,652	.....	82,176
Glassware, cut or decorated dut.	.....	278,064	.....	367,108	.....	1,885,683	.....	2,404,221
Blown glassware, n.e.s.—								
Bottles, ornaments, etc dut.	.....	324,731	.....	367,605	.....	1,293,882	.....	1,661,545
Bulbs for electric lamps dut. No.	1,088,904	10,324	753,961	11,591	15,185,607	155,807	15,847,413	178,546
Chimneys, globes, shades, etc dut.	.....	89,729	.....	70,990	.....	899,387	.....	826,836
Articles and utensils for chemical, scientific and experimental purposes dut.	.....	30,952	.....	32,671	.....	296,061	.....	455,759
Other glassware dut.	.....	133,911	.....	98,432	.....	963,136	.....	1,137,286